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LEARNING RESOURCES FOR COLLEGES AND UNIVERSITIES.

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CALIFORNIA STATE COLL., HAYWARD

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THE PRIMARY PURPOSE OF THIS PROJECT WAS THE DEVELOPMENT OF AN EDUCATIONAL PLAN FOR THE LIBRARY-AUDIOVISUAL SERVICES-ADMINISTRATION BUILDING FOR THE CALIFORNIA STATE COLLEGE AT HAYWARD. THE FIRST PART OF THE REPORT PROVIDES IDEAS AND RESOURCE INFORMATION FOR OTHER COLLEGES WITH SIMILAR NEEDS. THE PROBLEM OF LEARNING RESOURCES IS BROKEN DOWN INTO (1) AUDIOVISUAL SERVICES, (2) INDEPENDENT STUDY CENTER, (3) MATERIALS PREPARATION SERVICE, (4) LIBRARY SERVICES, AND (5) THE ROLES OF DIGITAL COMPUTERS. (MS)

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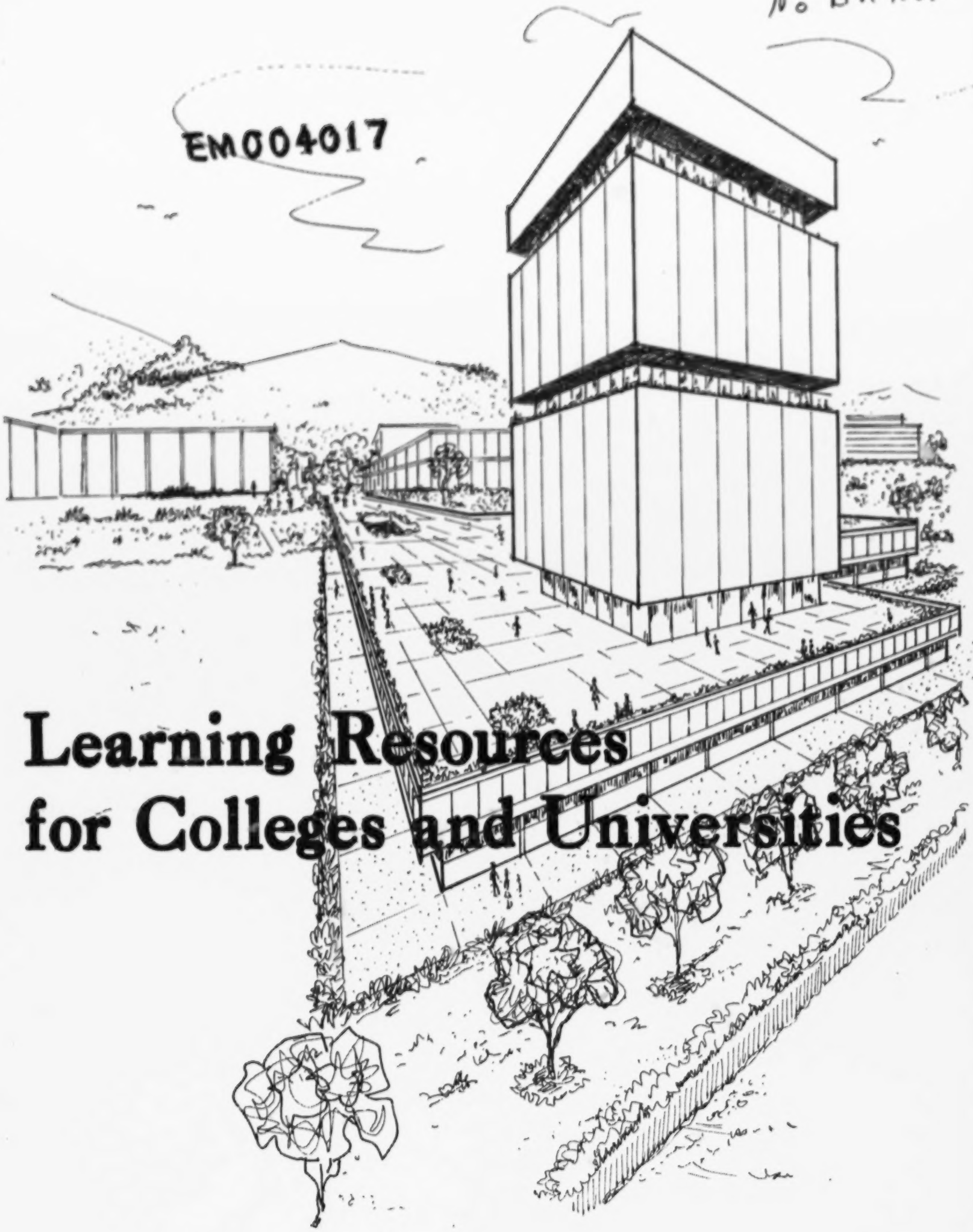

Learning Resources for Colleges and Universities

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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CALIFORNIA STATE COLLEGE AT HAYWARD

Hayward, California

September, 1964

LEARNING RESOURCES

for

COLLEGES and UNIVERSITIES

* * * * * *

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An advisory and assistance project, No. OE-3-16-025, of the Educational Media Branch of the Office of Education, U. S. Department of Health, Education and Welfare, as part of Title VII, National Defense Education Act, of 1958, entitled "Development of an Educational Plan for a Library-Audiovisual Services-Administration Building.

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FOREWORD

During its fourth year of operation (1963-64) the faculty of the California State College at Hayward had developed an extensive curricular master plan for the remainder of the decade. At the same time, the Trustees of the California State Colleges approved the campus plan for physical facilities for the potential student body of 15,000 full-time students expected by 1980-85. The library and audiovisual services occupied temporary quarters on the first floor of the Science Building, approximately 25,000 square feet. The long term master plan included a more permanent home for all learning resources. It was planned for use in 1969-70 and educational plans for it are to be completed by December, 1964. Hopefully, these plans are to be drawn in such a way that the building will be adaptable to the present wave of change taking place in methods of recording, storing and disseminating knowledge.

From 1961 through 1963 a faculty committee had already studied aspects of the problem. Following this study, the college officials requested an advisory and assistance project from the officials of the U. S. Office of Education which administers Title VII of the National Defense Education Act. The request was approved as Contract No. OE-3-16-025 and work on the project has been conducted during the 1963-64 academic year. It has been known as the DEPLAA project since the primary purpose of the project was the Development of an Educational Plan for the Library-Audiovisual Services -Administration Building for the California State College at Hayward. The project concerned the Library-Audiovisual Services part of the building. Although the primary purpose of the project is the development of a plan for a specific building at one college, the first part of the report is written to provide ideas and resource information for additional California State Colleges and for other interested colleges and universities throughout the United States.

Following are listed the names of the persons directly involved in some way in the work of the project.

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Assistant Investigators:	
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Other college officials actively involved:

David Mahaney	Coordinator, Building Program Lecturer in Engineering
Dale P. Wren	Executive Dean, Administrative Services Professor of Business
Robert O. Hall	Director, Division of Learning Resources Professor of Education
Mrs. Lorraine Zeyen	Project Secretary

The project report consists of two major sections. The first section is a textual report of general interest to persons studying this area. The second section is an appendix made up of materials which apply specifically to the planning of the first unit of a building which will house Learning Resources at California State College at Hayward.

The first section has been greatly expanded beyond the project's stated purposes to provide ideas for general use throughout the United States. The first chapter considers social changes and the demands made on education - with certain implications for planning learning resources. It also includes suggestions regarding major points which should make a difference in learning resource planning from campus to campus and a suggested administrative organization.

Three chapters then, cover in considerable detail the specifics of planning newer learning resources, including first, audiovisual services when broadly defined and including radio-TV, materials preparation services and center for independent study. The next two chapters enlarge further on (1) materials preparation services and (2) the Center for Independent Study and problem of evaluation of student achievement. The fifth chapter concerns libraries within the context of learning resources centers. Finally, the sixth chapter on computers relates present developments in this field and presents the few recommendations relating to learning resources that seem to be in order at the present time.

Section two, the appendix, has three parts. Appendix A is a statement of relationships between the library and all other learning resources, including a delineation of responsibilities and specific functions to be provided. This statement has been under study by faculty committees and specialists since 1960. This is a third major revision of the statement and represents thinking on the subject as of September, 1964.

Appendix B translates the policy statement of Appendix A into a specific list of functions and space needs for Learning Resources at Cal-State, Hayward in 1972-3 when the student body will approach 9,000 students.

Appendix C is a revision of the policy on Audio-Visual Services for California State Colleges as proposed in 1962. It is an amplification and

and revision of a somewhat out-of-date 1956 policy statement. It reflects careful study of the problem by the directors of 15 of the California State Colleges and has been carefully studied in connection with the DEPLAA Project. Limited circulation has previously limited its national usefulness so it is included as an appendix to this report.

The Principal Investigator assumes final responsibility for the content of the report. However, many other people deserve credit for portions of the report. Except for final editing and certain minor revisions, each Assistant Investigator prepared a chapter of the report as follows:

Chapter II	Audiovisual Services	Sidney Eboch
Chapter III	Evaluation and Centers for Independent Study	Donald Brown
Chapter IV	Materials Preparation Services	Eugene Whitehorn
Chapter V	Library Services	Floyd Erickson
Chapter VI	Digital Computers	Thomas Southard

Mr. Floyd Erickson and Dr. Robert Hall were primarily responsible for most of Appendix A and B, and Dr. Hall was one of the four AV directors who were primarily responsible for drafting Appendix C.

Two project consultants helped considerably with the report itself. Dr. William Allen made many suggestions regarding early drafts of Chapters 2, 3, 4 and 5. Dr. James Brown was of great help in reading the final draft and suggested many valuable editorial additions and changes.

The investigators hope these materials will be of service to colleges and universities. Many other colleges, universities, industrial companies and military installations (such as Redstone Arsenal) were visited to derive these conclusions, generalizations and specifications. In such a rapidly changing field, new experiences and insights constantly occur in many institutions. In the future, the investigators will appreciate reactions and new findings from others who study the complex problem of learning and the optimum use of resources for this purpose.

Fred Harcleroad
September 30, 1964

CONSULTANTS

The consultants listed below contributed many ideas and insights to the project investigators and other faculty members with whom they worked. The investigators wish to publicly acknowledge their thanks to each of them. However, the consultants often represented different points of view. Thus, none of them can be held responsible for the contents of this report although the "mix" of their ideas definitely shaped the final product.

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Chapter I

LEARNING RESOURCES: THE PROBLEM

Eight hundred years ago college and university students used extremely limited "learning resources." For example, at the University of Paris (established circ. 1175) one of the major subjects of study, metaphysical theology, was taught through one book, the Sentences (Sententiae) written by Peter the Lombard.[1] Books were so rare and valuable that they were sometimes chained to desks and carefully protected behind barred doors. In such a society the lecture method was the major method for teaching and learning. Students in the early Italian universities established minute rules governing the start, length and end of lectures, plus the speed and manner of delivery. Lecturers who talked too rapidly were fined part of their pay. In this way students could be sure to obtain a complete set of notes (a book) of the master's lectures which they could take with them, and thus not depend on the library. Printing advances during the Middle Ages made such rules less necessary but the library continued to be primarily a book depository until the 19th century. Thus, for at least seven of the past eight centuries, the lecture or lecture-recitation has been the primary method of teaching and the limited availability of stored information has strongly influenced the educational methods used for transmitting the accumulated wisdom and experience of the ages to each new generation.

Some eighty years ago Charles Eliot appointed Justin Winsor, Harvard's scholarly historian, as the college librarian -- and "... he began a new era in the Library. His 'fundamental principle that books should be used to the largest extent possible and with the least trouble' was revolutionary -- and in a majority of the world's libraries it would be revolutionary today."[2] Thus, wrote Samuel Eliot Morison in his 1936 history celebrating Harvard's Tercentennial. Interestingly enough, Harvard's fixed curriculum requirements for a degree still included Greek until the same decade (1880's) when Winsor opened the library to students. Eliot's greatest fight involved the dropping of the Greek requirement. Eight other New England presidents, led by Yale's President Noah Porter, begged the Board of Overseers not to drop the requirement. But Eliot won his point and the elective system was upheld. Simultaneously, as part of the same educational movement, the library was opened for expanded use by students. In the past eighty years it has been thrown open even wider, with open stacks, widely dispersed reading rooms and study desks throughout the library.

Technological improvements make knowledge more easily available - and available to more people. Gutenberg and his movable type speeded up book production and replaced almost completely the hand-copying of books by

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1. See Hastings Rashdall, The Universities of Europe in the Middle Ages, pp. 155-156. The Clarendon Press, Oxford, England, 1895.

2. S. E. Morison, Three Centuries of Harvard: 1636-1936, Harvard University Press, Cambridge, Massachusetts. 1936. (See pp. 31-32, 396, 478).

cloistered monks. More recently high-speed photographic and electronic processes have provided an "economy of abundance" for all persons eager to tap our sources of stored information and the preserved insights of our forebears. Today's problems regarding "learning resources" are not their lack of availability, but, rather, the difficulty in storing them, keeping track of them, and finding them ("retrieval", in present terms) when they are needed. And, with speeded-up travel and communication making the entire world a closer community than was the United States in 1870, the student needs stored knowledge from the entire world if he is to be truly "a liberally educated" person. Likewise, the scholar-specialist needs research information from all studies in his field no matter where in the world community they have been conducted and no matter what the language or media which have been used to preserve the findings.

With the sheer quantity of information doubling every decade, storage and distribution have become critical problems. It is estimated that 60 million pages of new printed material alone were produced in 1963, a portion of it being an estimated 320,000 books.[1] In 1964-65 the modest five-year old library of the California State College at Hayward is approximately the same size as was Harvard's library at the time of the Civil War, after two hundred and twenty-five years - approximately 120,000 volumes. The open shelves of the modular libraries of the last three decades have provided students opportunities to browse through collections and read in diverse fields. Various types of Micro-format provide more storage in less space - but at the same time they place a technical barrier between the student and the material to be read. Thus, our very abundance of learning resources has increased the organizational and logistic problems of making our resources available for use.

We are fortunate that these resources for learning have become available at this time -- even with the problems they present. James Finn has called our present period, a "Revolutionary Season"[2] forced upon education at all levels by surging social forces which cannot be denied. The enormity of the changes exerts tremendous pressure, forcing basically conservative educators to adopt and use new resources.

All of these various facets of social change affect colleges and universities -- and many of them have critical effects. Any important force affecting higher education will affect the program of learning resources. Furthermore, certain important social changes are primarily in higher education itself. Following is a brief discussion of eleven major conditions which exist -- all important to colleges and universities and some of a critical nature to proper planning for use of learning resources.

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1. Scholar's Work and Works. Office of Reports, Ford Foundation, 477 Madison Ave., New York 23, N. Y., p. 17.

2. Finn, James Dr. "A Revolutionary Season," Phi Delta Kappan, Volume 45, April, 1964, pp. 348-354.

1. "Change" as a "constant" of society.
2. The "knowledge" explosion.
3. The "population explosion."
4. Population movement.
5. Changing composition of our population.
6. Changing technology and re-education of the work force.
7. Increasing leisure time.
8. Changing patterns in the work force and in service industries.
9. Improvements in transportation.
10. Shortage of college professors.
11. Expansion of services of higher education.

1. "Change" is the "constant" of our emerging society: Higher education must help people prepare to change in at least two major ways. Students must be provided with such intellectual tools of flexibility as a truly analytic approach to problems and their solution. Likewise, students must have a thorough opportunity to gain an understanding of trends which will help in the anticipation of future changes. Problem-oriented learning resources and materials showing trends can directly affect students in this area of need. It is critical to select and buy materials with these goals in mind.

2. The so-called "Knowledge explosion" and the development of the "Knowledge industry" places a heavier load on college teachers, and students than at any other time in history. Faculty expectations of their students are rising. Four years is still the standard period for earning the college degree. Although coursework such as trigonometry, analytic geometry and calculus is being pushed into high school -- and a basic college degree in such fields as architecture or engineering is often five years -- most students are being pushed to learn more in the same four year period. As a result of these increased demands, more students must borrow money or obtain scholarship aid to attend college. Less time can be taken for outside work or extra activities -- and none for so-called remedial or deficiency courses in mathematics, english composition, oral communication or study skills. Programmed materials and independent study centers provide ambitious students with the opportunity to make-up deficiencies or move ahead more rapidly in coursework they can study on their own.

Different approaches to independent study such as those at Montieth College of Wayne State University, Goddard College, the University of Colorado and many others change the conceptual framework for organization and disposition of learning resources. Professors can determine which skills and knowledge do not demand their personal explanatory efforts and which concepts, ideas and understandings may require their interaction with the students -- in order that the time of both will be used optimally. In moving from what Jerome Bruner called the "expository" mode of teaching to the "hypothetical," more problem-centered mode, the professor can free himself from routine exposition and the mere imparting of facts. Learning resources staffs must be organized to help in this analytic process.

3. The "population explosion" has produced the predicted "tidal wave" of college students and we can expect student bodies to double to 8,500,000 by 1975.[1] With the changing high school curricula and the higher standards of achievement demanded by society in general, these students will be far better prepared than most college students of the thirties, forties and fifties. The student bodies already include more graduate students, more married students and more women students. At the same time that the numbers grow there is insistence on equality of "educational quality" for all, not just for equality of opportunity. In the midst of sky-rocketing numbers the demand for quality goes hand in hand with the need for an individual to preserve personal identity and personal respect. Learning resources must, consequently, be individualized by technology without mechanizing the approach to each student.

4. Other changes than numbers take place constantly in our population. We move continually -- from rural to urban to suburban and possibly in the future back to the central city. Migration trends show people moving to the north, the west and the southwest. Any one college or university will have students from diverse educational and cultural backgrounds. A broadly conceived "learning resource" program can be a major base for developing some common understandings.

5. Our population now shows an increasing proportion of youth and senior citizens. A smaller proportion of the population now works to support them. Productive workers need better total educational experiences to be more efficient and to produce more, in order to support and educate the youth and older citizens.

6. Changing technology and increasing knowledge require a constant upgrading and re-education of the total work force. Such diverse workers as doctors of medicine, teachers of physics or bio-chemistry, oil refinery technicians and firemen need regular, continuing re-education. Learning resources of all types must, therefore, be kept up-to-date and internal technical processes must be speeded up to make new materials available immediately. Computer-based retrieval of stored micro-miniature materials is presently "around the corner" -- but must be tried out, analyzed and planned for use in future decades. It may be limited to specialized libraries or especially large libraries -- but it will be used in higher education. Television, of course, can provide "immediacy from afar" if needed for educational up-grading or re-training. Local campuses need to have facilities to pick-up and relay such learning materials on campus -- and, also, provide duplication facilities to store video-tape type materials for later study and analysis.

7. Leisure time for all citizens is rapidly increasing. The profitable use of leisure time is a problem of major concern to our entire society. The outlook of the person with the leisure time is strongly conditioned by

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1. Bricks and Mortarboards. Ford Foundation, Educational Facilities Laboratories, New York 22, N. Y. p. 7.

his educational background -- and higher education shares this problem with other educational agencies.

Added leisure time is characteristic of all economic levels in our society and is caused by many things. For example, automation of production lowers the number of workers needed to produce food and goods. In addition to forcing re-training, it provides more leisure time for productive workers and earlier retirement from active employment. An increasing number of persons work in service industries rather than in direct productive industries. Our state welfare subsidies of less-productive workers give them leisure time, as well. All told, our society needs a continuing careful evaluation of all work to determine the amount of education needed for each type of work, and the training and re-training needed. This continuing evaluation in each applied field of knowledge affects materially the goals of the field and causes a constant need for additions and changes in the learning resources available in the college or university resource center.

8. Changing patterns in the work force and in service industries: Since World War II women have entered the work force in large numbers. Shopping habits have changed and many stores and service industries have stayed open nights and on weekends. To some extent this has increased the attendance of part-time students at colleges and universities. It has also placed pressure on colleges and universities to expand their service schedules. In the future learning resource centers may have to be open six or seven days a week and around the clock.

9. Improved transportation, primarily the automobile, has increased the proportion of college students who are regular commuters to the campus:* Simultaneously students in residence halls have grown in numbers while decreasing greatly in proportion to the total attendance in colleges and universities. For both types of students there has been some attempt to provide learning resources where they live, or to provide check-out opportunities for portable equipment and materials. Commuters to Chicago Junior College and San Francisco State College, for example, have had some instruction by open circuit TV. Residence hall students at the University of Michigan have language or audio laboratories in the residence hall. Michigan State University sends instructional TV courses into residence halls, as do such a variety of other institutions as the State University of New York at Albany, Syracuse University and Stephens College. Of course, for years many residence halls have included small, selected library collections -- but the abundance of "paperbacks" has led to an extensive expansion of such collections. Learning resource programs, more and more, have expanded to provide a wide variety of materials for use where the students are, rather than force them to come to a central location.

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* Interestingly enough, architects usually allow 150 sq. ft. per undergraduate student, but each space for a car rates 300 sq. ft.

For commuter students small study stations have been set-up on a few campuses. These are sometimes known as offices, carrels or as "Q" spaces (for individuals in the "Quest" for knowledge). The increasing proportion of commuting students places a premium on planning for their presence on campus and for making learning resources available wherever they may be. A good example is at the Florida Atlantic University where the study offices for commuting students contain a receiving unit; tape recording and playback unit; writing desk; storage spaces; book shelf; and phone connection to the central TV-audio services for ordering materials to be studied at this "remote" station.

10. Shortage of college and university professors: This shortage exists at the same time the number of students is doubling. Higher salaries in business and industry attract many potential professors. Also, those who remain in the profession spend a great deal of time in part-time consultation and research activities for business, industry and/or government. When these are coupled with the expansion of knowledge, it makes it more important than ever that professors (1) carefully assess the materials to be taught, (2) reserve analytic problem-centered concepts and understanding for themselves to teach and (3) relegate repetitive, simple, factual materials to programmed learning, independent study, and testing.

11. Services of higher education expand: Demands of modern day society have led to rapid expansion of services by institutions of higher education. Adult education for many professional groups is an important charge on professional schools and colleges. Extension services of all types provide continuing cultural, professional and up-grading types of community service. Organized consulting services are provided to business and government. Research contracts form a large part of the budget of many universities and a growing number of colleges.

    The increasing commitment of the United States in world affairs has led many colleges and universities to provide these same services to many foreign countries. Our country provides a great deal of capital and the faculty members of our colleges and uni ersities provide much of the know-how. Along with these foreign services has come an expansion of curricula designed to give the home population an understanding of the cultures and needs of different people all over the world.

Learning resources have to meet the needs of professors working in all of these areas. Whether it is extension classes, institutes or research projects -- at home or abroad -- the necessary books, slides, pictures or graphics must be available. Michigan State University has even conducted a three year program in Brazil which was assigned to develop a learning resources program for that country's schools and universities.

In the midst of all of this change, uncertainty and upheaval, learning resource specialists in libraries, at independent study centers and

Automated Electronic Carrel from Florida Atlantic University. Note television screen, the head set for listening and the other specialized facilities which are provided.

television centers must remember an individual is still their primary audience. With the uncertainty in our society and its confusing, contradictory systems there is increasing emphasis on conformity and attention to groups. At the same time that technology forces us into systems, our attention to, and study of use of, materials must remain on individuals -- the persons who, finally, must in each case learn for themselves.

BASIC CRITERIA FOR PLANNING LEARNING RESOURCE CENTERS

Society as a whole provides the money to support the learning of students at the college level -- whether it is a publicly-supported or privately-supported institution.

The basic paradigm for college-level learning is really very simple. It consists of the student, the instructor, and the addition of learning resources. These three components develop in a multiplicity of ways and can be put together in a wide variety of circumstances. Put the three together and "learning experiences" should result.

Society conditions the basic process in two ways. First, public subventions or private gifts support particular curricula believed to be worthy of this support. Second, measurement and evaluation of the success of the student -- and in the process, measuring the success of the college -- is important to the society which pays the bills. As a consequence, a wide variation of types of colleges exists in the United States. They are supported in a variety of ways because various curricula and differing levels of student achievement appeal to and are supported by a wide variety of people. Thus, many types of students are served and a multiplicity of different teaching-learning situations have been established. Higher education includes great extremes in curricula in these various specialized colleges, technical colleges, liberal arts colleges and universities. Improved technology has increasingly become available to provide diverse learning resources for these various types of students and for the wide variety of curricula and institutions. Therefore, the planning for "Learning Resources" will vary markedly from one institution to another.

A plan for housing learning resources at any given college or university depends on the following critical variables: (1) the methods of instruction used, (2) the students to be served (3) the faculty to be served, and (4) the local concept of learning resources. For example, a private, residential college with limited curricula and a limited student body could house its learning resources in a far different way than a downtown, commuter-type vocationally-oriented technical college. Consider the following points in the analysis of a given institution.

Methods of Instruction: Large Class, Discussion or Individual Study

Learning resources and their proper use must be considered in terms of the current attention being given to the redistribution of professorial talent. The current emphasis on larger classes for straight lecture courses, along with small discussion sections for the individual give-and-take possible in such a section, is an important development at the present time. Another important variable is the increased opportunity for college instructors to consign repetitive, purely factual content to programmed materials. To do this the instructors must analyze the total educational process and determine which aspects of the process merit professional attention. After meticulous analysis of the individual tasks to be done and the content to be learned, many college-level courses can be partially

or completely "programmed." This programming can be done with all types of learning resources -- from books to films to video-tape clips -- and can result in the provision of materials through which the student can learn by self-study in an "individual study center." Many colleges have provision for "credit by proficiency examination" -- and by this method students may earn the necessary college credit from such independent study. Learning resources planning in colleges and universities must consider these possibilities and the proportion of time allotted to each.

Students in Relation to Planning

There may be many kinds of students to be served in the multiplicity of colleges in the United States. Here are a few of the different types which might be, and should be, considered in analyzing the potential spaces to be provided for learning resources and the way in which they should be scheduled and used.

1. Students, residents or commuters. What is the proportion of residence and commute students at the college? What types of spaces will be available in the residence halls, for study, classes or cultural activities? What types of services will be needed on the campus for students who are primarily commuters? At what time of the day? Do the commuters work? Will they spend some out-of-class time on campus?

2. Students with specific goals in mind. Do some students wish to be educated for specific vocations (mathematicians, accountants, or teachers)? These students have definite direction and a knowledge of what they want. On the other hand, is there a group of students who have not determined their specific goals? There may even be students who are registered but do not want to learn! How much service and attention do you plan to give them? What difference will this make in the way learning resources are made available? For example, should special study carrels be provided for students who have special goals in mind? Should any special areas be provided for groups who are not sure which majors they wish to take? For example, should there be a film-strip viewing area in the counselling center which provides vocational and occupational guidance?

3. Students with a very specific learning objective. Do some students wish to learn a specific skill in which they are deficient? If a college gives no course work in the use of the slide rule, for example, can the learning resources of the college be mobilized to enable a student to learn to use one by himself?

4. The mix of lower division, upper division, graduate, and post-doctoral students. Varying proportions of students at each level can make a major difference in the types of materials which are provided and in the types of study areas which are developed.

5. Students who can and cannot profit from automated instruction. Those with past experience with various types of "teaching machines" in high school may be contrasted with those who have never had any experience. In such cases the learning resources center probably should provide instruction and background for use of this type of learning device.

6. Students with wide cultural differences at the same college -- some with very strong and some with meager cultural backgrounds. The college as a whole may have a large program of out-of-class instructional activities and cultural development. However, the learning resources center in any type of institution may be so set up that it can help take care of cultural differences. What particular differences in the organization of the various materials and spaces for learning should be made to help in this particular problem? Cultural film series or book talk sessions in small auditoria?

7. Increasing numbers of part-time students and extension of the service period: Plans should be made for area controls during hours when the use is less extensive than at other times. Operational and staffing plans for around-the-clock operation could make considerable difference in the way the physical arrangements are made.

8. Many colleges have "junior" students. These students come as demonstration students in speech therapy, elementary education, creative dramatics and other similar subjects. What arrangements should be made in the learning resources center for these students to make use of the facilities?

9. Students learn from "browsing." Open-stack book libraries provide ideal "browsing" opportunities. Will other phases of learning resources do the same? If so, for how many students?

Faculty Needs and Interests

Faculty members of many types and kinds will have to be served by a learning resources center. The activities with which the faculty members concern themselves will determine the way in which they wish to be served. Among some of the important considerations which should be considered are the following:

1. Variety of curricula to be served? Some faculty members are in fields concerned primarily with words -- as contrasted with those in which their use is less necessary. Students in this latter group may spend more time in the laboratory or in the field and deal with things rather than words, concepts and ideas. How should different parts of the learning resources complex be adapted to such differences?

2. Dependence upon materials sources. In the field of the humanities, the laboratory is the library. In other disciplines, the library may be one of the laboratories for the discipline. What is the proportion of attention given to the various types of subject matter in the college or the different colleges of the university? This goes back to the total philosophy of the institution -- but it is critical in the determination of the collections to be built and types of materials to be purchased.

3. Teaching vs. consultation and research. Are some faculty members primarily concerned with all aspects of teaching and instruction? Are other faculty members concerned primarily with research and consultation work? The proportion of faculty members involved in each of these different activities could have a great deal of impact on the way in which the learning resources complex is organized, developed, and provides services to various faculty members on the campus.

4. Methods of instruction used. The institution may be one in which there is a group of faculty members who are interested only in classroom instruction and who would like to have lecture materials prepared to enhance their lectures for large classes. The proportion of this type of instruction at the college will make a big difference in the provision of certain types of materials and facilities.

5. Faculty sophistication with respect to learning resources. At what stage of development are the members of the faculty in the use of various types of technological aids and resources for learning? If there are many faculty members who are interested in the use of certain types of materials, it may mean that early planning in the learning resources complex should provide for more emphasis in this field. It could also mean that unused types of materials have not been developed in the past, and that greater attention needs to be given to them in the development of future facilities. This question must be analyzed in a particular situation.

6. Faculty members to be served. Most faculties contain a number of persons who are really inventive in their teaching. There are some who are truly creative in their research -- and carry this over into their teaching. Most faculty are quite dependable, reliable, steady, and thorough. The program for use of learning resources and the process of working with the faculty in each department will be conditioned by the analysis which can be made of the interests and abilities of the members of the faculty. Some will need and demand an individual study carrel in the library. Others, will work diligently in the area of filmstrip and film production, making materials for their classes. Plans for the learning resource center need to be flexible enough to accommodate the variety of faculty members and their interests -- as well as the increased numbers that are coming to many of our rapidly-growing institutions.

Other Planning Factors

Three other factors exert potential influences upon details of planning learning resources services and facilities: (1) the local definition of "learning resources" -- scope of the services to be offered, (2) the extent to which learning resources services will be used, on campus, for essentially non-instructional purposes, and (3) the extent to which they will be used by non-college elements within the college service community.

The local definition of "learning resources" can affect planning considerably. However, for purposes of this project "learning resources" are (1) "stored knowledge" in whatever form it may be preserved, and (2) the media to store and reproduce it for later use by learners, for presentation by teachers, or for the active developmental use of either. The term is meant to include equipment and a wide variety of actual printed, electronic or photographic materials -- ranging from simple slides or tape recordings to complex reference books which represent years of analytic effort. The following list of "Resources for Learning Experiences" is fairly complete and sufficiently discrete for most colleges and universities to use in judging the completeness of their plan.[1]

Books
Reference books, encyclopedias
Magazines, newspapers
Documents and monographs
Duplicated materials
Programmed materials (self-instructional)
Motion-picture films (8mm or 16mm, including filmed kinescopes of TV programs)
Television programs (broadcast or closed-circuit)
Radio programs (AM or FM)
Recordings (audio tape and disc -- listening or language laboratories)
Recordings (video tape, electronic recordings of TV programs)
Flat pictures
Drawings and paintings
Slides
Large transparencies
Filmstrips
Micro-format materials such as micro-film, micro-cards, micro-fiche, micro-code, and photochromic micro-image
Stereographs
Maps, globes
Graphs, charts, diagrams, posters, and cartoons.

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1. Adapted from Brown, James; Lewis, Richard; and Harcleroad, Fred. Audio-Visual Instruction: Materials and Methods. (revised) McGraw-Hill Book Company, New York, 1964.

There are certain additional problems related to allied non-instructional organizations on the campus which will wish to use the learning resource center's facilities. Student organizations of certain types will need public address equipment, advice on preparation of graphic materials, and other similar services. Likewise faculty organizations will need the same type of advice and assistance. Campus administrative problems often lead to the need to prepare materials, use public address systems, and organize and publish materials of value to the college or university. These uses, while basically for organizational purposes, must be considered in the preparation of plans for such a center.

Finally, many colleges and universities need to consider the problem of community use. Community uses of campus facilities will vary widely with the amount of public support of the institution and the public purposes which it is obligated to assist and further. The following suggested types of community use of learning resources are only a beginning. Each college or university which provides such service will have to analyze its own programs and in much more specific detail than this. In some cases, the amount of community use could make a major difference in the amount of equipment purchased, the type of space planned, and in the arrangement for near-by parking facilities. The problem is extensive. This discussion includes a limited number of examples to encourage further thought by anyone using this monograph for a particular institution's problem.

1. Will the institution provide college-level open-circuit television credit courses? High school credit courses? If the station on the college campus is operating on FCC-assigned channels, it will have educational responsibilities to the community. The college or university may very well need a separate closed-circuit television system for on-campus operation -- and with a completely separate administration from the open-circuit television station.

2. Will professional people in the area or region served need access to specialized materials in the learning resources complex? Will medical practitioners, for example, be able to use materials developed at the professional medical school of the university, on call or by special permission?

3. Will high school students be able to come on the campus to use the facilities? Will this be limited to advanced students who get special permission or will all "standard" high school students from a surrounding area be able to use the libraries of books, films, filmstrips, records, and programmed materials?

4. Will professional personnel of school systems in the area be able to obtain various kinds of information from the learning resources center? Will they be able to check materials in and out? Will there be a special distribution system set up for serving such a specialized need? For example, some colleges and universities operate rental libraries in order to provide materials to school

systems in the region -- and sometimes throughout the world. This is a fundamental policy question and is an extremely critical question in deciding the organization and facilities to be provided in the learning resources unit.

5. Community groups may want demonstrations of the various facilities within the learning resources complex. This may necessitate a different type of space from that which would be used for small college groups. How large should demonstration rooms be, if they are primarily for off-campus groups? Will there be a relationship to an extension division or to a continuing education center? It may be that a satellite "learning resources center" will be needed in a continuation education building or in extension centers throughout a state.

6. Will private organizations be able to use the materials in the learning resources complex? If so, what rights and privileges will they have? Should there be a special check-out section provided in the book or film library areas? Should there be special arrangement for instruction of private individuals in the operation of equipment -- in order that expensive materials will not be "wrecked?"

7. Will the materials production center produce materials for community use? In some cases production centers produce films, filmstrips, records, and brochures on contract with various companies, industries, and foundations which pay them to do so. What relation will such production have to the production of materials for college instructional use? Which will have priority? Will equipment be amortized from two different sources? Or, will one area subsidize the other? Hopefully, the college support budget will pay for service to faculty and students and not expect the book or film libraries to make money from off-campus service to support legitimate student and faculty uses.

8. Is the community responsibility of the college or university so great that it will be difficult to define services which are within the college and without the college? On the other hand, is the college so autonomous that it can draw the line very specifically and allow practically no services to the community?

9. Will there be special collections established in the learning resources complex which are primarily for community use -- but which help the college collection by being on the campus and available for limited use by faculty and students? Certain special collections may require special handling, special facilities, and special equipment.

Finally, after considering the needs of students, the needs of faculty, and the potential community use of materials in the learning resources center, the planners must determine what proportion of use will

be so significant that it has to be taken into consideration in the overall planning. Certain fields may use the library primarily. Certain fields may make primary use of the materials preparation services. Others may use a great many slides and special arrangements will need to be worked out for servicing their materials (for example art and biology.) Following a total analysis of this type, it should be possible to determine what facilities need to be built, what spaces must be allowed for each function, and the relationship of these functions within the total learning resources complex.

SUGGESTED PATTERNS OF ADMINISTRATION

Most colleges and universities combine instructional administration activities under a vice president for academic affairs or a dean of instruction. In very large institutions this area is sometimes split rather arbitrarily because of too large a span of operation. The learning resources area could be split-off in this way. However, in most colleges or universities, learning resources should be directly responsible to the chief instructional administrator.

Two possible organizational patterns are suggested. Individual institutions can use either one, depending on availability of strong leadership and the capabilities of personnel for various responsibilities.

CHART I

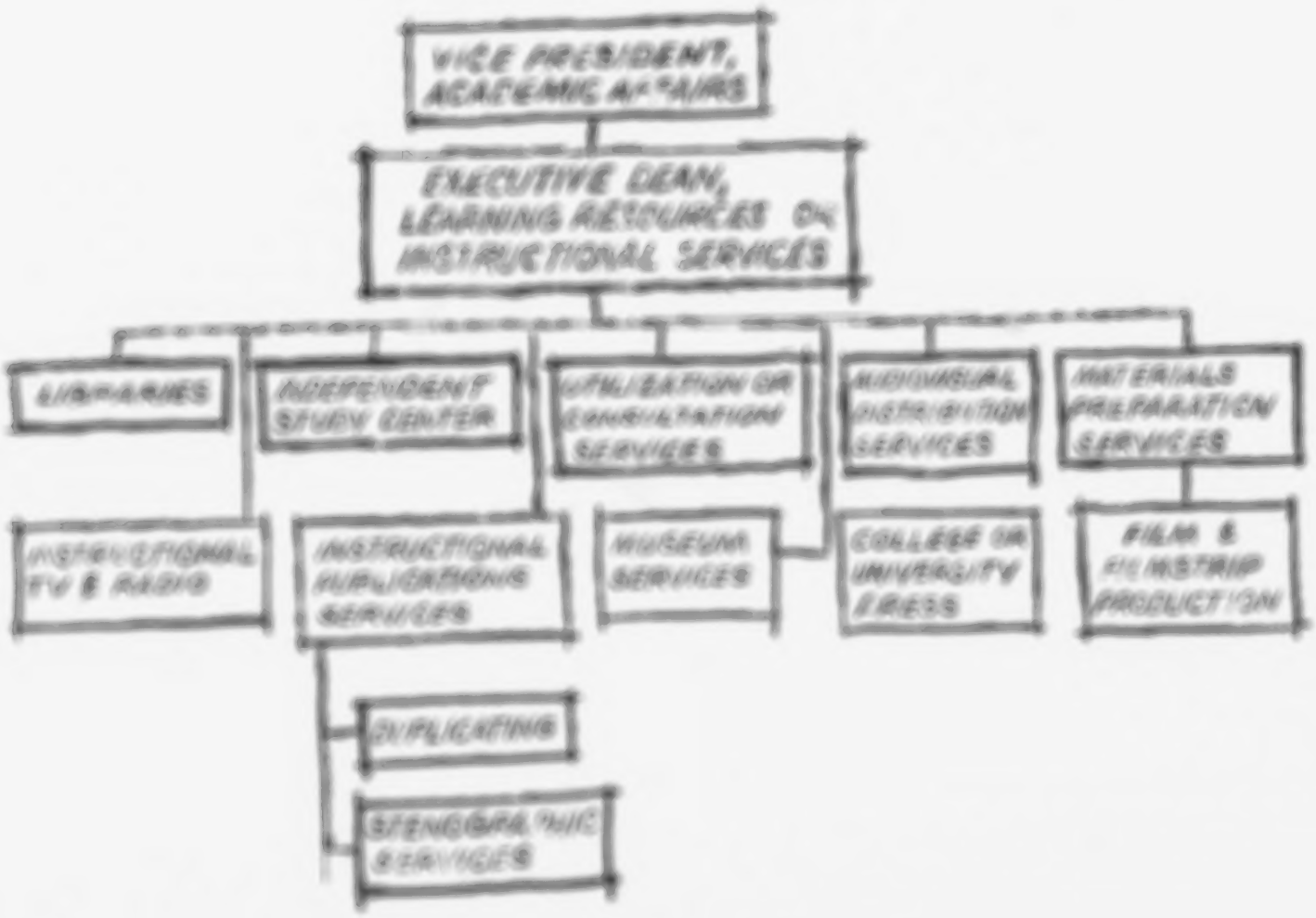
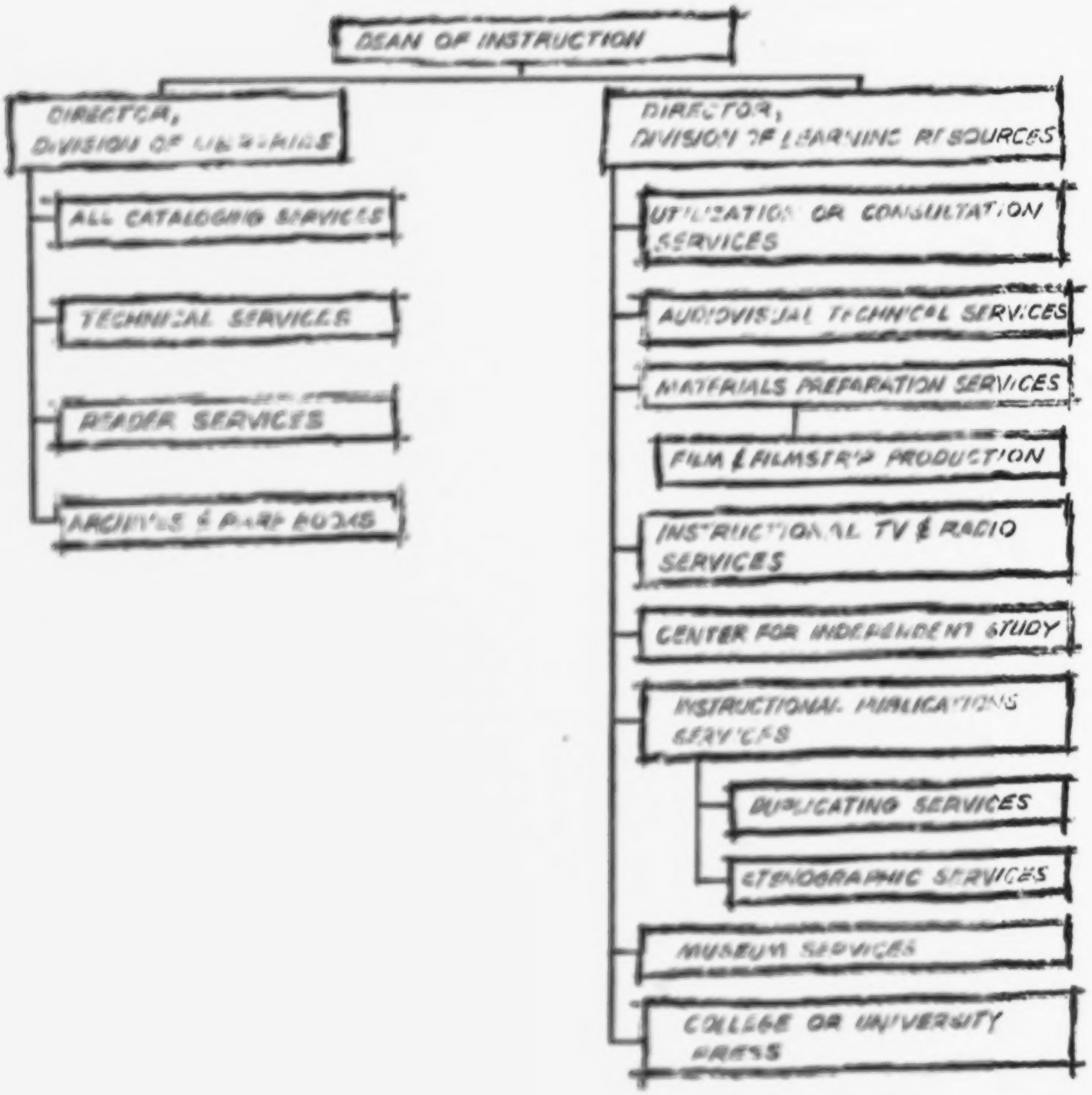


CHART II



The major difference between the two suggested administrative patterns is the inclusion of all learning resources in one grouping responsible to an executive dean who in turn is responsible to the vice president in charge of academic affairs. In the other plan, there are two directors -- both responsible to the dean of instruction -- one of whom is basically the director of the libraries and the second the director of the various new media (and older media) which are classified as learning resources in this document. In the later chapter on audiovisual services (learning

resources) a slightly different administrative organization is suggested in case of a particular type of development. In all of these plans, the utilization or consultation service should be the first place for a user to go -- and the consultant in that service will direct people to other parts of the learning resources complex.

The only items not discussed in later chapters are those of museum services and the college or university press. A brief mention of the press is made in the chapter on audiovisual services. Certain colleges and universities have strong museum programs and the museum director may report directly to the dean of instruction, the vice president, or in some cases the president of the college. No special study has been made of this museum service in connection with the project. However, it is suggested that this area may be included as a part of the administrative organization of the learning resources program in the event that either of the administrative organizations suggested in this chapter are put into effect.

There are as many administrative organizations as there are people and institutions. The pattern suggested above will help to unify the approach to learning resources in the college or university. Either one should make it possible for a college professor (who wishes to do so) to organize the use of learning resources in a way which will make teaching or research activity more effective and personally more satisfying.

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Chapter II

AUDIOVISUAL SERVICES

The traditional orientation of the term "audiovisual services" is the gamut of instructional materials and equipment related to projection and sound reproduction. (15) This concept has been greatly amplified in the decades since World War II. The terms "educational media" and "instructional technology" have broadened traditional audiovisual services to include several functions not conceived in the traditional framework. Instructional television, teaching machines and programmed learning, use of the overhead transparency projector, new concepts of staff utilization, new methods of grouping students, an emphasis on independent study by students, and the general cry for "excellence in education" have made new and dramatic demands on the traditional instructional support services of educational institutions. In this context of conceptual growth and increased public demands, audiovisual services are increasingly being considered an essential part of instructional service in higher education.

The technological revolution has caught most colleges and universities without an appropriate framework for development of such services. Recent studies have shown that (a) there are few well developed service units which provide all-inclusive services (5)(20), and (b) the adoption of or experimentation with new technological innovations is limited and uneven.(1)

In the course of this project, the local staff has shared the vision of a few institutions which are attacking the problem of comprehensive instructional service development. This report attempts to delineate a few of the dimensions of the problem which any institution faces when considering building facilities for audiovisual services. Audiovisual services, in this context, are defined to include the concepts associated with "new media" and "instructional technology." The older term is retained because of its greater familiarity.

THE BASIC FUNCTION

The basic function of audiovisual services, as conceived here, is the design and implementation of information and transmission display systems which are appropriate to specific instructional objectives in well-defined educational situations. (10)

"Information" as used here refers to the common meaning of the term; it is facts, knowledge, data, news, lore.

"Transmission" is conveyance, transfer, passage between one person, place or thing and another.

"Display" is to exhibit, to present, to show.

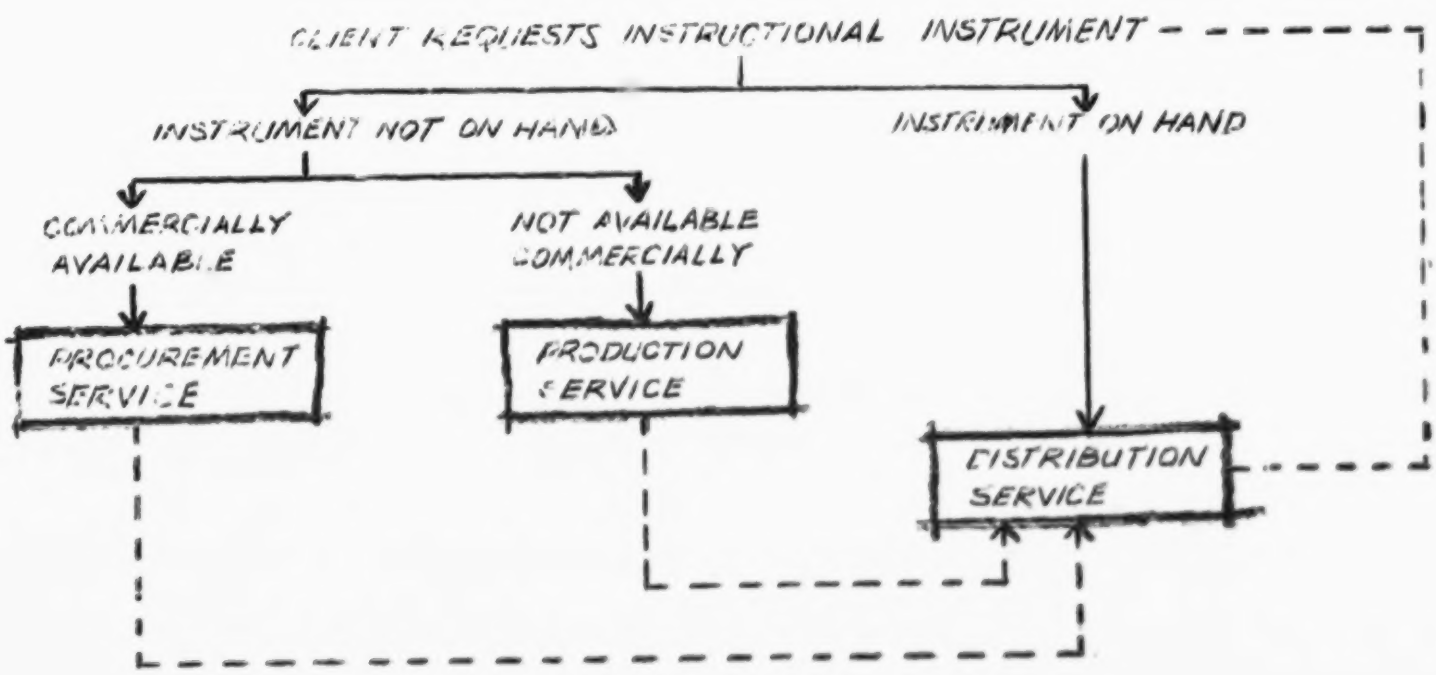
"Systems" refers to a collection of parts which perform a unitary function when the parts are appropriately related and used in an organized manner.

"Instruments" refers to any device or group of devices which contains and conveys information. The term is used to convey the unity of what have been called "machines" and "materials." The concept here is that projectors serve no useful purpose without films in use together. Occasionally, the terms "machines" and "materials" will be used to designate parts of a transmission system. However, there should not be confusion between elements of the transmission system and the implicit idea of information or content which is being conveyed by an instrument.

No presumption is made here regarding the role of information transmission and display as an all-inclusive method of teaching. It should be specifically inferred by the reader that other means and techniques of teaching are considered desirable and effective. This section of the report deals with information transmission and display because it has been defined as the limited objective of audiovisual services. The author believes the role of transmission and display should be determined by the instructor and implemented by audiovisual services.

A GENERAL STRUCTURE OF FUNCTION

From the basic function defined, the ultimate service rendered is what might be termed the distribution of educational experiences. Within the context of distribution, the major tasks and sub-tasks of the service unit can be defined and related. A chart of these service-task relationships is presented below.

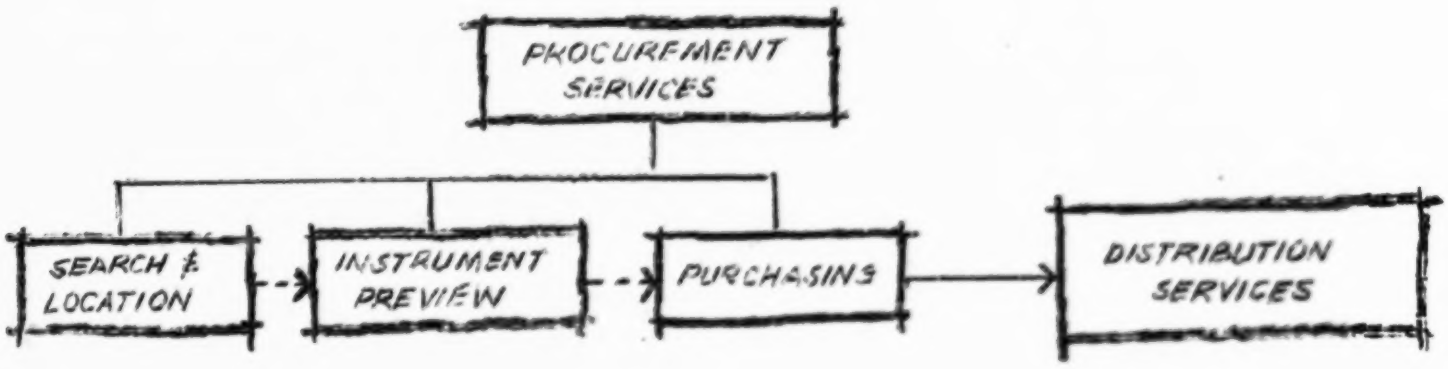


Implementing each of the major services outlined (Procurement, Production, and Distribution) are several professional and technical services which perform sub-functions of considerable importance.

PROCUREMENT SERVICES

Procurement service covers a range of tasks related to obtaining those instructional "experiences" which are commercially produced and distributed by an outside agency. In essence, the audiovisual service unit frees the instructor of problems associated with obtaining materials already in existence.

The general sub-units operating under procurement services could be related as indicated in the following chart.



Search and Location services are designed to find all the sources of all materials, equipment, or instruments related to the customer's request. This is service typical of buyers or expediters in commercial firms.

Instrument Preview services provide facilities for clients to examine desired items prior to purchase. While these are conventionally envisioned as rooms where films may be seen or recordings may be heard, they should also include facilities for examining various types of equipment and testing them under real or simulated use conditions.

Purchasing services are those services normally rendered by the purchasing department of any firm. Orders are processed to the appropriate vendor at the best price obtainable.

PRODUCTION SERVICES

Production services are defined here to include all services required to construct desired instructional instruments not already commercially available. The gamut of such services possible is extremely broad. In the case of print, for example, it could range from the typing of a single page of paper to the production of several hundred books of

conventional size. For display items it might run from a single, small cardboard poster to a full-scale exhibit meeting museum standards. In photographic work it might range from a single contact print to the production of a sound, color motion picture. In recording services it might run from a simple tape recording of a short speech to a complete television program of broadcast quality.

Decisions as to what services to offer and on what scale are increasingly difficult to make. A revolution in information equipment which duplicates or processes all types of media is now seen as having created the oft-feared embarassment of riches. For relatively slight cost ($10,000), for example, it is now possible to secure rather sophisticated learning resource equipment, i.e. small, high quality printing presses, complete motion picture production equipment, a small video tape recorder. It is tempting to spend all available money to have one or two "dramatic" production capabilities.

Even if the institution is able to avoid staking its prestige on a single production facility rather than to develop a well-rounded service for all instructional needs, there is still a persisting problem of equipment incompatability. Buying equipment of one type commits one to the characteristics of the system it represents. Purchase of a "Little Hercules Production Machine", for example, limits one to the size, type, and quality of that particular machine, as well as to related expendable products of the firm producing it. The mushrooming equipment industry has failed to standardize processes, materials, or equipment. However, decisions must be made and almost any decision in terms of production facilities is a compromise which has to be outlived.

In broadest terms, the production function itself can be divided into two forms: Recording and Duplication. Recording includes such obvious tasks as lettering posters, taking photographs, and recording lectures; duplication includes such tasks as mimeographing, copying slides, producing diazo transparencies from translucent masters, or re-recording magnetic tapes.

Although, in terms of the media involved, a satisfactory classification of production has never been achieved (9), four primary classes of this service have been designated, as follows:

Print: Those media containing primarily written forms of language as commonly seen in textbooks;

Pictorial: Those media containing primarily non-language visual images and including such forms as graphs, charts, pictorial illustration forms in all types of media (cartoons, posters, photographs, and others).

Sound: Those media conveyed through air wave patterns, regardless of original form, such as language, music, "natural disturbances" (wind, for example), motor sounds, and others.

Combinations: One or more of the above sound types in such mixture that dominance of any one content-form is obscured. Television and motion pictures combine picture and sound in this manner. Magazines like Life and Look combine print and picture in such a manner as to defy a single classification.

Most instructors are aware of the capabilities and increasing sophistication to be obtained through print. A single typewritten copy can be multiplied with carbon paper. Next, a fluid duplicating master provides a limited number of good copies with a short image life; mimeographing extends the number of possible copies as well as image permanence. By using multilith or certain other printing processes, illustration capabilities of the medium may be improved.

Similar combination possibilities arise with photographic media. A series of slide photos can be made. The slide sequence can then be placed in an automatic slide projector. The projector can be linked to a tape recorder. A tape recording can be made which provides the commentary appropriate to each slide illustration and the recording can carry a silent signal to the projector, assuring the presence on the screen of the proper slide to accompany the recorded speech. The picture and sound combination in a fixed sequence provides for endless use in exactly the same form.

Thus, the description of production services is fraught potentially with many confusions. Because many audiovisual service units have included a "graphics" production service, this type of production is described in another portion of this report.

Publications Services. Although not a conventional instructional support service, it is conceivable that some institutions might develop printing press facilities as a standard service. Printing processes have become so simplified and press equipment so economical (by comparison with former costs) that consideration might be given to this service function.

Simplified forms of printing services are provided through fluid duplicator and mimeograph processes. More sophisticated versions such as multilithing may be available within an institution in the public relations section of administration or alumni units. Some instructional areas such as industrial arts may have commercial printing facilities.

University presses have been a growing service of higher education. These publishing units have greatly expanded the quality and quantity of their publications in the past ten years. Their traditional role has been to publish the research and scholarship which could not hope for a mass market but deserved a wider audience than the author's professional associates. With this tradition, it is difficult to see the presses performing standard printing services for regular classroom instructional needs, e.g., printing 250 copies of a trial text to use in a limited number of classes or printing 50 copies of a programmed textbook as a research tool.

However, institutions considering the implementation of audiovisual services as described in this report should recognize that many forms of

print services are already existing on most campuses. Coordination of these facilities might be achieved with some provision for an instructional support service in print which would be comparable to other media discussed. However, because print services have been traditionally based in the commercial publishing industry, no recommendations are included here for space allocations.

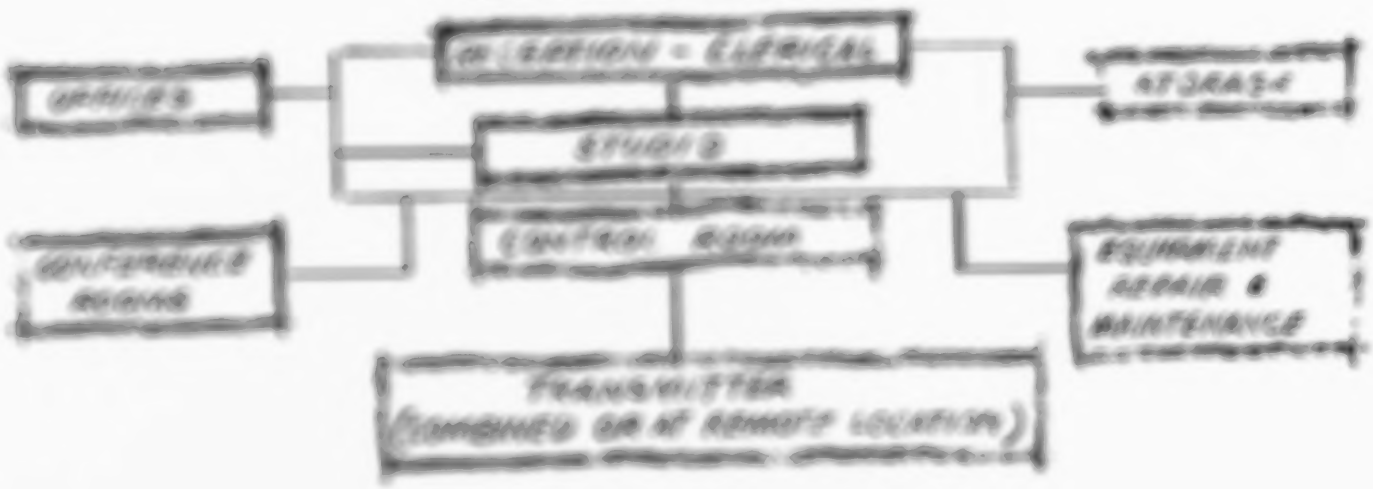
Radio and Television Production Facilities. Almost from the origin of general broadcasting, radio and television stations have been part of higher education. Educational radio was in operation, for example, even before commercial radio networks were formed. And, included in the first hundred television stations was one operating a statewide service. In general, these facilities have been oriented toward one or more of three basic purposes: (a) public service broadcasting, (b) in-classroom instruction, (c) providing training opportunities for students seeking vocational preparation in the field.

Both radio and television services have been plagued with problems in rendering in-classroom services. Time schedules of broadcast stations and schools have been difficult to coordinate. Establishing the necessary exchanges of information between broadcaster and teacher, and between student and broadcasting-instructor, have been almost impossible. But, although both types of broadcasting service have provided impressive and long standing contributions to education (1), they have failed to meet existing potentials.

The new recording technology promises help in integrating broadcast materials in classroom instruction. Productions can now be recorded from a radio and transmitted later to classrooms through intercommunication systems or played there on inexpensive tape recorders. While television broadcasts can be preserved for later viewing through use of videotape recorders, this process requires expensive equipment for both recording and playback.

Facilities for such production services range from a simple magnetic tape recorder in any room (recording a tape to be re-played over a radio broadcasting station) to complex television studios with control rooms and associated storage, repair, and construction facilities. Desirable space categories for each type of facility are diagrammed below.

RADIO STATION



TELEVISION PRODUCTION

While several publications (for example 3 and 25) describe television installations in greater detail, institutions planning such facilities should seek technical help from appropriate industrial and professional associations. Carpenter and Greenhill (23, p. 305) advise that:

> In planning new buildings for television there are critical points which need special attention. (1) Adequate electrical power should be available for the TV systems, control rooms, lighting and air conditioning. (2) Control rooms should have visual access through glass into originating rooms. (3) Adequate storage space for parts, electronic maintenance areas, and space for the preparation of instructional materials should be available nearby. (4) The course coordinators ("producers") and engineers will need office space and desks or benches. (5) Space for running cables must be provided. This will be more space than is usually estimated. . . .

Motion Picture Production Facilities. For more than thirty years, some colleges and universities have maintained their own motion picture production facilities. Presently, more than fifty institutions of higher learning, including many major colleges and universities throughout the nation, have them (23). While in many instances they are involved in the limited operation of producing sixteen millimeter productions often primarily on location, their list of achievements is impressive. Many of the films growing out of such work have won international awards; at least one has received an Academy award from the Hollywood film industry.

Typical space use of motion picture production is diagrammed on the next page. Some institutions would prefer to use outside commercial agencies for part of the production requirements, this is especially true [illegible] with those assigned to television production. Motion picture film might be a support service for television production, but major film production would require separate facilities. In any event, space required for storage and scenery construction might be combined and enlarged to serve both types.

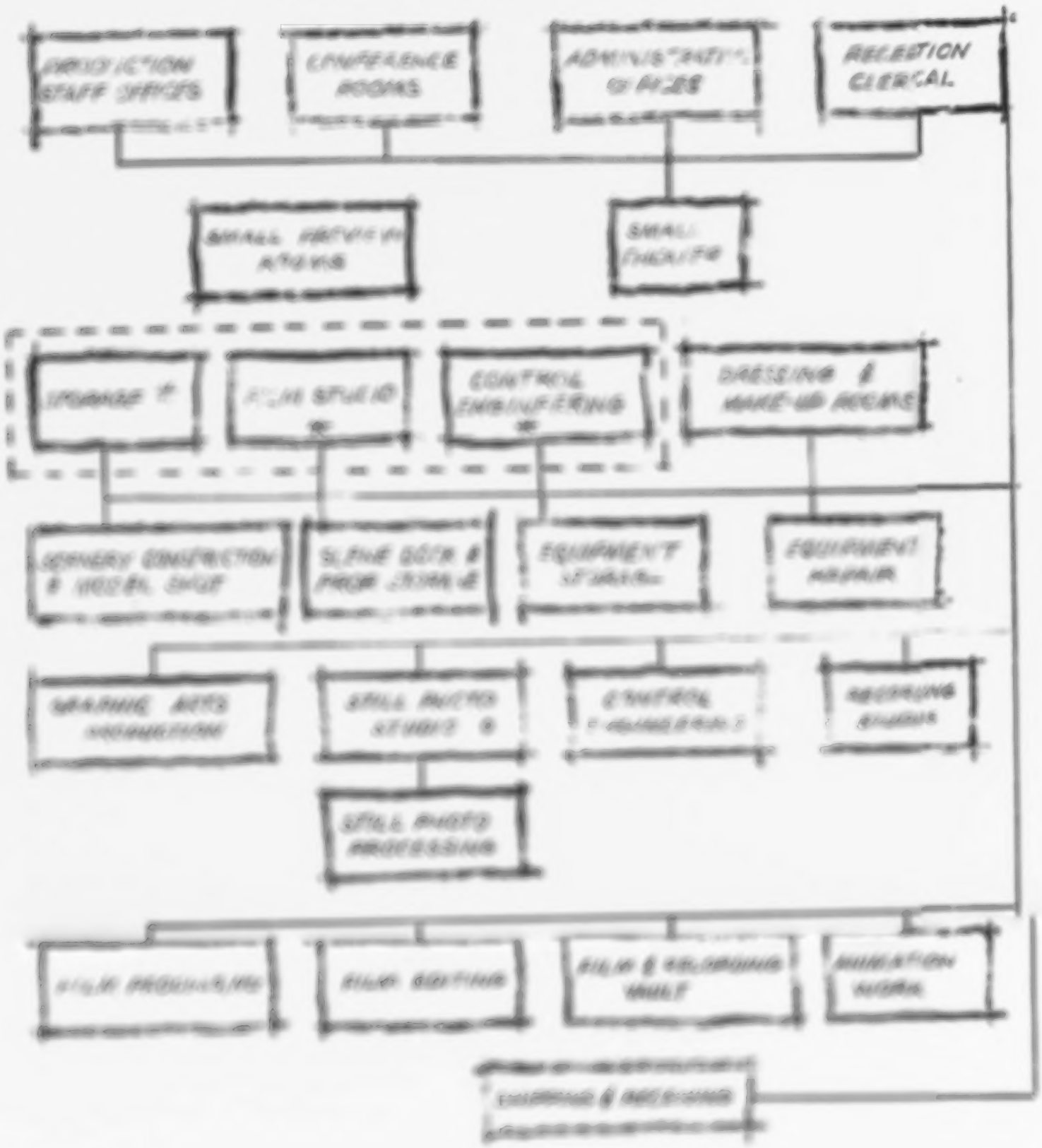
FOOTNOTES for Page 33

Studios may be in multiples but should always include control and storage areas for each studio.

These facilities may be available in the conventional audiovisual center.

Review: In a comprehensive service facility some areas represented here might be used jointly by regular television and/or radio production. Consideration should be given to toilet facilities and mechanical equipment (telephone panels, air conditioning units, etc.) rooms usually for this service area.

MOTION PICTURE PRODUCTION



DISTRIBUTION SERVICES

"Distribution of educational experiences" is the ultimate service to be rendered by an audiovisual center. While the traditional library has made available the use of text materials, the audiovisual center has become the source and means of providing the kind of classroom instruction that is dependent upon materials and equipment presenting visual or auditory experiences. Thus, the audiovisual center has housed and distributed instructional materials and equipment required for their classroom use, while the library has provided a storage and distribution center for individual study during a student's non-class hours.

As audiovisual services have grown in institutions of higher learning, a pattern of service levels similar to the following is common:

1. The audiovisual center collects and houses projection and sound materials for faculty use.

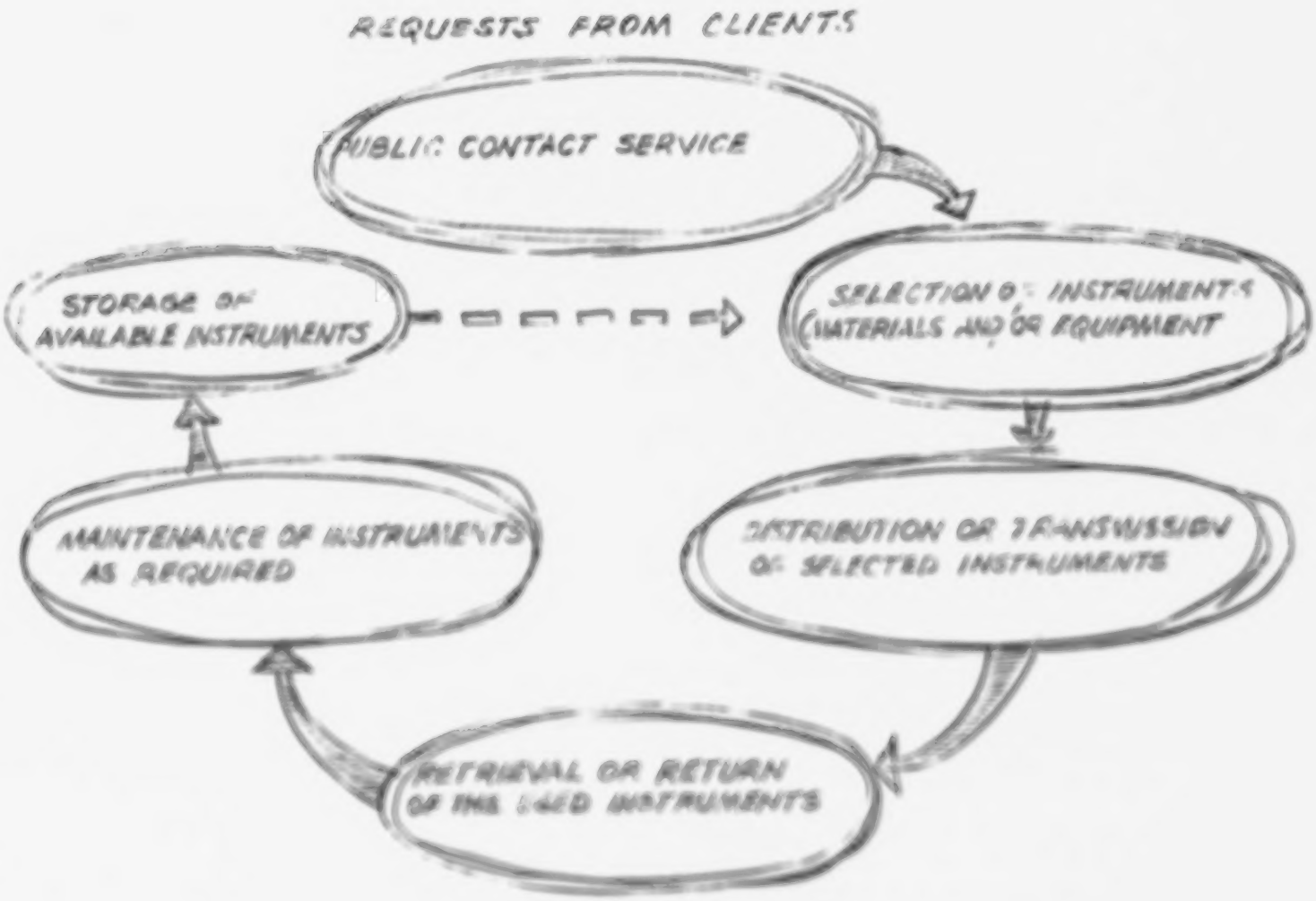
2. The audiovisual center provides a delivery service for materials and equipment to designated classrooms for specific instructional uses.

3. The audiovisual center provides delivery and operator service for materials and equipment in scheduled classes, i.e., an audiovisual technician delivers, sets up, operates, and returns to storage any requested instructional aid.

4. Audiovisual experiences are transmitted to the classroom through mechanical or electronic means on [illegible].

A fundamental difference between the library and audiovisual service is the increasing responsibility of the audiovisual center for classroom utilization of materials. While primary and professional decisions are made by the faculty member, operational distribution responsibilities are assumed increasingly by the Center. In actual practice most audiovisual centers operate at all four of the levels of service at the same time. Personnel work loads, instructor's preferences, and special conditions make each level of service desirable on given occasions. The point is that audiovisual centers have increasing and different types of space needs depending upon the level of operation supported by the institution.

The Distribution Cycle. Functions performed by a college or university audiovisual center are similar: materials and equipment are stored, maintained, and distributed for utilization. The basic cycle of these service functions is charged below.



Storage is appropriately a self-defining task since it involves no immediate personnel action, once the basic system has been established. However, it needs to be separately identified so as to indicate space design requirements that might otherwise be lost in sub-tasks.

Maintenance involves the following sub-tasks: inspection, cleaning and minor repair, and major overhaul. Each of these sub-tasks is related to machines as well as to materials. Performance demands are different for instruments which (a) are unitary, (b) use machines or equipment, (c) are primarily materials.

Utilization might involve any or all of the following sub-tasks: (1) assistance in selecting appropriate instruments, (2) a means of previewing available instruments, and (3) assistance in using selected instruments, after analysis of instructional problems. The sub-tasks to be performed would be determined by the level of service offered by the audio-visual unit.

Space must be provided for these utilization services. They are rather typical of any shipping-receiving operation. The public contact area would be most like a library card catalog room and circulation desk. Maintenance rooms would require the electrical test-repair facilities to service the equipment used. Storage areas would require a variety of shelving arrangements suited to the package characteristics of the materials and equipment being stored. Additional space would be necessary for preparing the instruments for distribution; most equipment such as tape recorders, motion picture projectors, or television sets would be transported by rolling carts.

This would require a "staging area" having sufficient space for several loaded carts.

A proposed space design showing typical area relatioships is provided on page 37.

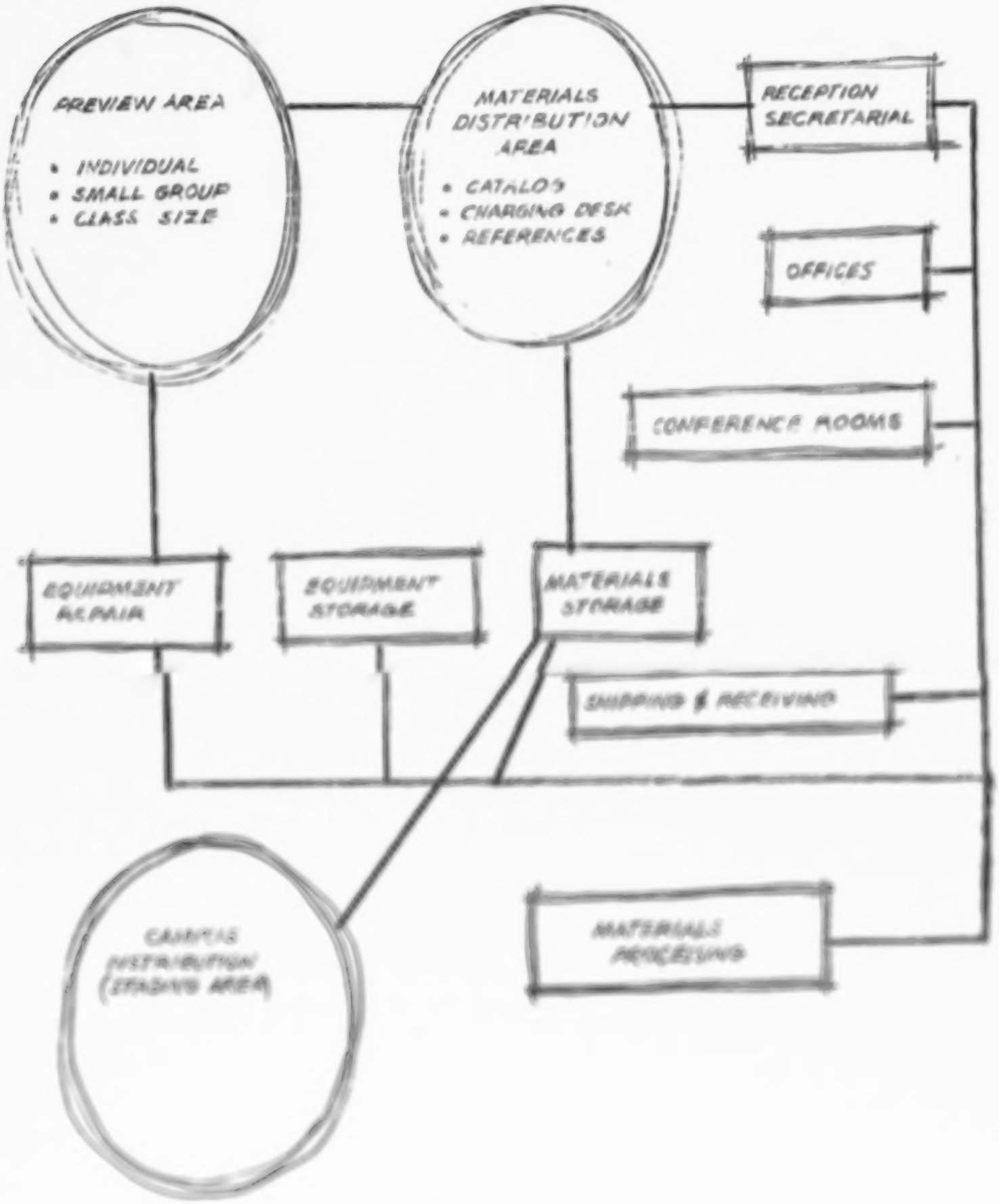
Special Circumstances and Transitional Problems. The 1950-60 decade saw the spread of some new teaching tools such as television, language laboratories, and programmed learning facilities. These developments reflect two complementary trends growing out of concepts of staff use and student time patterns. On the one hand, television makes possible the simultaneous transmission of educational experiences to almost infinite numbers of students; thus, in one sense, the traditional walls of the classroom are removed. On the other hand, the use of language laboratories and programmed learning devices provides more specific instructional control over the "independent" learning activities of students; thus, in one sense, the instructor now can watch the student practice as an individual.

In both cases, the traditional role of audiovisual centers is chaged. Where formerly most materials and equipment were physically delivered from storage to classroom and return, physical distribution can now be replaced by electronic transmission. Where formerly most materials and equipment were used for instructor presentation only, new tools and materials permit the student to call upon the "instructor" for repetitive presentations. Student learning also may be measured through the use of programmed materials. Television has changed distribution to transmission. Programmed learning has changed presentation to measurement. Thus, learning resource centers provide these broader functions and include audiovisual services as part of their complex.

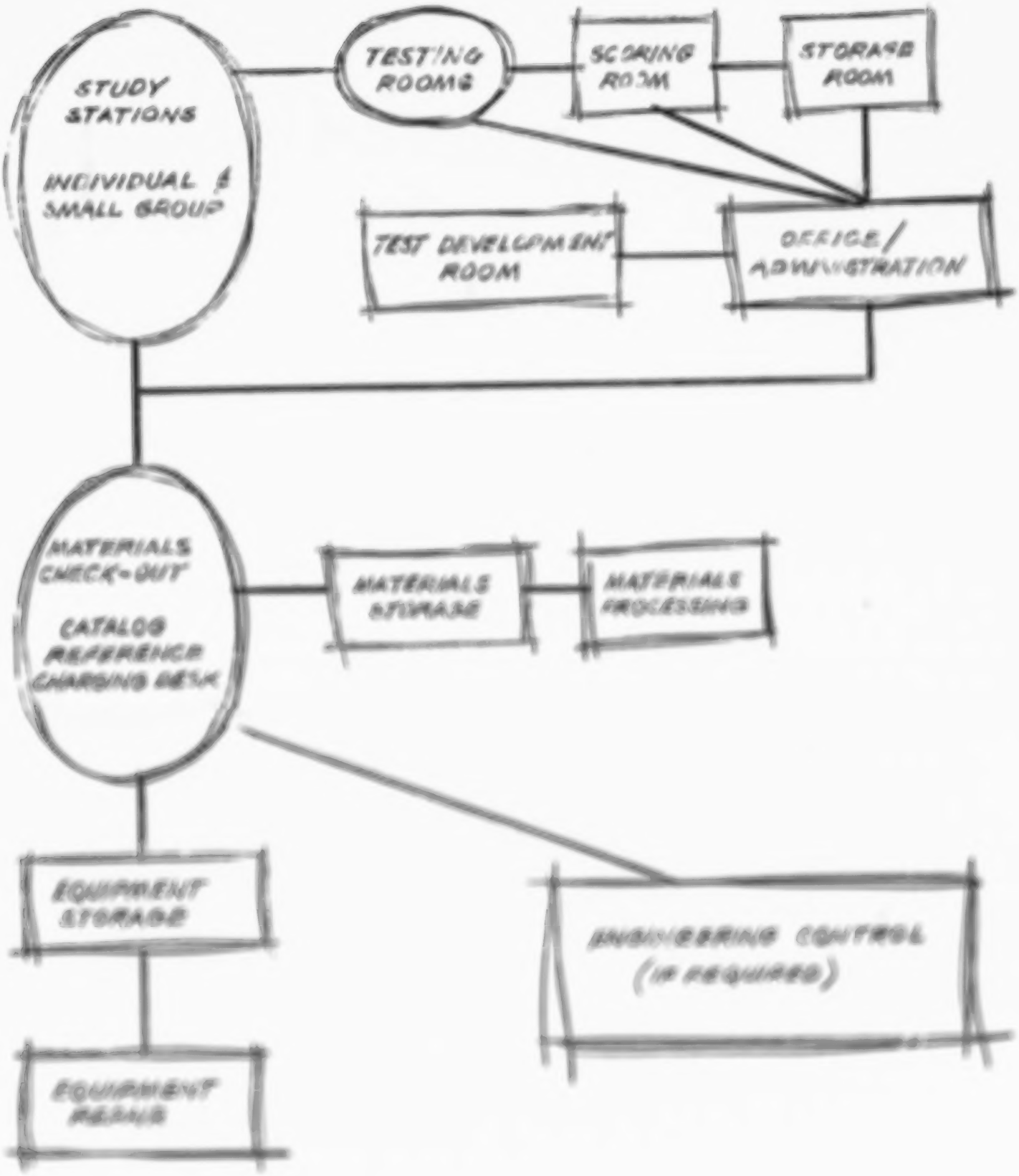
Programmed learning and television now permit the classroom to be placed physically at almost any location. Immediate space needs for television are not appreciably different from facilities planned for regular television broadcast purposes. The immediate space needs for programmed learning in the learning resources center are similar to individual study spaces in a library, with the exception that additional power must be furnished in individual study stations to permit equipment operation.

Institutions such as Pennsylvania State University and Chicago Teachers College have gained extensive experience in television teaching at remote locations as part of regular college level instruction. The use of language laboratories has been extensive in high schools and colleges throughout the country. Programmed learning laboratories have been installed at colleges and universities on rather single levels. The television facilities involve the adaptation of instructional spaces outside the audiovisual center, therefore these modifications are not created here. Since programmed learning laboratories have been associated with either library or audiovisual facilities, a chart showing space needs is included. (See also the next section of this project report, dealing with Evaluation and Centers for Independent Study.

AUDIOVISUAL DISTRIBUTION CENTER



CENTER FOR INDEPENDENT STUDY



In connection with programmed learning facilities and related to multiple and simultaneous data transmission and display (via television or other media), experiments and trial operations are using computers to select and sequence instructional experiences. Now, it is technically possible to provide individual or group programmed learning experiences which have been selected by the computer and programmed in such ways as to adapt to individual student or instructor needs. Such programming represents an operational level of the highest order known at this time. The only element added beyond the facilities already described is the use of a computer for the controlled display and transmission of data. Levels of use in any given situation might justify the use of a complete computer facility devoted solely to this purpose. In practice for the foreseeable future, it is probably that only part of the time or part of the output of a computer would be required for this instructional function. Computer facilities per se are described in another section of this report. Readers interested in computer applications to classroom instruction will find references 2 and 3 helpful. (See also Chapter VI of this report).

SOME ASSUMPTIONS AND RELATED ISSUES

The Professional Role of the Audiovisual Staff. Institutions of higher education are noted for insuring faculty freedom and autonomy in instructional matters. But the type of instructional support system presented here is an example of an "organization" or "system" or "machine" that could eventually control rather than simply serve. Values to be derived from such a system depend, in large part, upon clear understandings of the interdependent roles of the faculty and the Center staff. The provision for human error that the faculty will and should continue to exercise control over the content and method of instruction. Audiovisual service facilities should aid in implementing instruction, not in restricting or regulating it. But neither is it the function of the audiovisual staff to become "high priests." Routine clerical and technical work related to preparing and using instructional materials may be needed to provide a support system. But a professional staff is needed to advise and design the most appropriate communications media and to establish conditions appropriate for their use. The instructor determines purpose and function; the Center staff recommends the appropriate means of obtaining the maximum results.

A Learning Resources Center of the type envisioned here would require a complement of professional, technical, and clerical personnel far beyond the scope of most service facilities now found in colleges and universities. One lesson gained from programmed learning and television is that personnel costs will be high. One institution (Florida Atlantic University) currently approaching the scope of services described here, for example, plans an initial service staff equal to that of the total faculty, i.e. there will be one support person in the audiovisual and library services for each currently-employed faculty member. A consultant to this project, with experience in all phases of learning resources programs, estimated that to fully implement the program for preparing materials and

measuring learning, approximately fifty times the present number of staff members would be needed. This implementation would also require extensive office and conference space which is not shown in the space diagrams included with this section of the report.

The Impact on Other Campus Facilities. When audiovisual services are initiated it should be recognized that their success will give rise to new problems in other facets of the campus. While audiovisual services are meeting the instructional needs of the faculty from special facilities of the types described in this report, the actual assistance to instruction takes place in another environment. The most comprehensive and efficient audiovisual service facility has little contribution to make to instruction if films cannot be shown in a classroom which lacks light control, for example, or if the language laboratory does not have sufficient power to operate all the required equipment. Services to faculty and students obviously require a teaching environment capable of supporting effective uses of instruments provided.

Conduits for cables, adequate power, light control, ventilation, wall display fixtures, and similar facilities add relatively little to the initial cost of buildings. Post-construction modifications, on the other hand, are usually costly, unsightly, and inconvenient to make.

The Changing Nature of Equipment. One of the great unknowns in planning audiovisual service facilities is trends in instructional equipment. This equipment has tended to become (1) less expensive, (2) easier to operate, i.e., less technical or more nearly automatic, (3) reduced in size and weight, and (4) increasingly powerful in performance. Such trends contain implications with respect to needs for storage space, repair and maintenance, or effective use of tools in the instructional environment. The long term trend in all institutions having these services appears to be one of continued growth. Therefore, any improvements in space-saving or space use will be less than that required as a result of the normal growth of services rendered. The almost universal experience of these services, like those of libraries, has been a too-conservative estimate of space needs.

A second factor related to instructional equipment pertains to the increasingly larger systems of equipment that commit purchasers to certain types and capacities of production or transmission and display. As indicated in the section, "Production Functions", these decisions are necessary compromises which, in time, must be outlived. Maximum flexibility and utility of building and interior spaces should be guiding principles. To be caught up in simply hoping or waiting for equipment to alleviate some building problem will probably result in a non-productive delay.

A corollary to the "wait-for-the-ultimate" approach is the belief, of some, that an institution can "leap-frog" certain aspects of support services. The most obvious thought in this regard is that television is one way of eliminating need for other more private services. However, most of the complex or "advanced" types of service are based upon or will require

the two basic services: a library of materials and a materials production facility.

The Economic Base. Regardless of the nature of functions selected or the number or quality of services instituted, the fundamental decision remains primarily economic. The decision to implement any level of the audiovisual services described is a decision to spend a specific amount in one place rather than another. There are minimum levels of support which are required to initiate any one or a combination of functions. Development should proceed on the basis of planning; token supports of poorly-planned services results only in instructional "dabbling" and a wasteful drain on the educational budget. Proper development requires adequate planning and assured minimum support for a limited number of functions rather than "paper programs" with more emphasis upon public relations than upon contributions to instruction.

THE ARCHITECTURAL PROBLEM

Building design for the learning resource center depends upon many factors determined by the special needs of the institution, its financial capabilities, and circumstances in which it operates. Pertinent planning data for building design would include such basic statistics as: (1) number of faculty members, (2) number and capabilities of students, (3) number and types of classes, (4) enrollments in various curricula, (5) records of past audiovisual services, (6) projections of anticipated growth, (7) analysis of other classroom facilities presently in use, and (8) other kinds of similar information. Decisions on functions to be performed within the building should be based on such information. Although the final design selection may be somewhat arbitrary, functions of the buildings can be determined by considered judgment and most conceivable, economically-feasible demands. The architect can perform most efficiently when the client is well informed on his needs and has a soundly planned program to be performed in the building.

Within this framework of intelligent, informed choice based upon a planned program of operations the architectural problem may seem deceptively simple. With modern conceptions of change, there is great demand for flexibility in buildings. With modern building materials, flexibilities become possible, although caution is necessary when it is applied to the consideration of audiovisual facilities.

A maximally flexible building facility could be developed as an enormous shell filled with movable partitions. Audiovisual services especially need built-in flexibility for power requirements. This can be accomplished by installing honeycomb floors and ceilings that permit electrical power taps at many points within the shell. Architecturally, these spaces are relatively simple to provide. However, as with the client "Everybody's responsibility is nobody's responsibility," the maximum flexibility may be the minimum capability in specific instances. Audiovisual services include equipment and materials which require controlled

light and sound controls. The controlled environment is necessary for handling, maintenance, repair, and use. The maximum flexibility in a building must include satisfactory conditions for the care and use of such equipment and materials. Certain areas of the building housing audiovisual services must be well-equipped with facilities for light and sound control. Such areas will not provide the maximum flexibility in the original building. Therefore, planning needs to be based on the most specific and accurate information possible. In these cases, one of the possibilities for accommodating change would be to use a modular plan. If the specific services which require controlled conditions can be developed into a "building unit" it may be possible to plan the future addition of module building units as requirements change. Planning modular units would be a worthwhile consideration in several instances. Small and expanding schools could standardize and grow in an orderly manner. Institutions with more complete campuses could consider decentralization of services by modifying existing buildings on a modular plan.

It would, however, be a mistake to think that all facilities can be planned in a modular mode. Some types of spaces (individual preview spaces, for example) could be multiplied without significant difficulty, whereas others could be multiplied only if all combined elements are included. (e.g., television studios with combined control rooms and storage spaces.) Still other types of clerical, and secretarial spaces are examples of proportional-increase spaces rather the modular spaces.

COMBINED FACILITIES

Assuming the development of a truly comprehensive facility, some economies might be obtained through the combined use of spaces, i.e. the joint use of "internal" spaces for one or more service units. It would be a mistake to think that one large storage space, for example, could serve all needs of the entire comprehensive facility; however, some combinations might be achieved in a well planned facility.

Common Space Needs for More Than One Audiovisual Function or Service	Common Space Needs for Library and Audiovisual Services
General storage spaces	General storage spaces
Equipment storage	Equipment storage
Equipment Maintenance	Equipment Maintenance
Materials Storage	Materials Storage (Stacks)
Graphic Arts studios	Duplicating services
Still Photo studios	

Still Photo processing

Scenery docks

Property storage

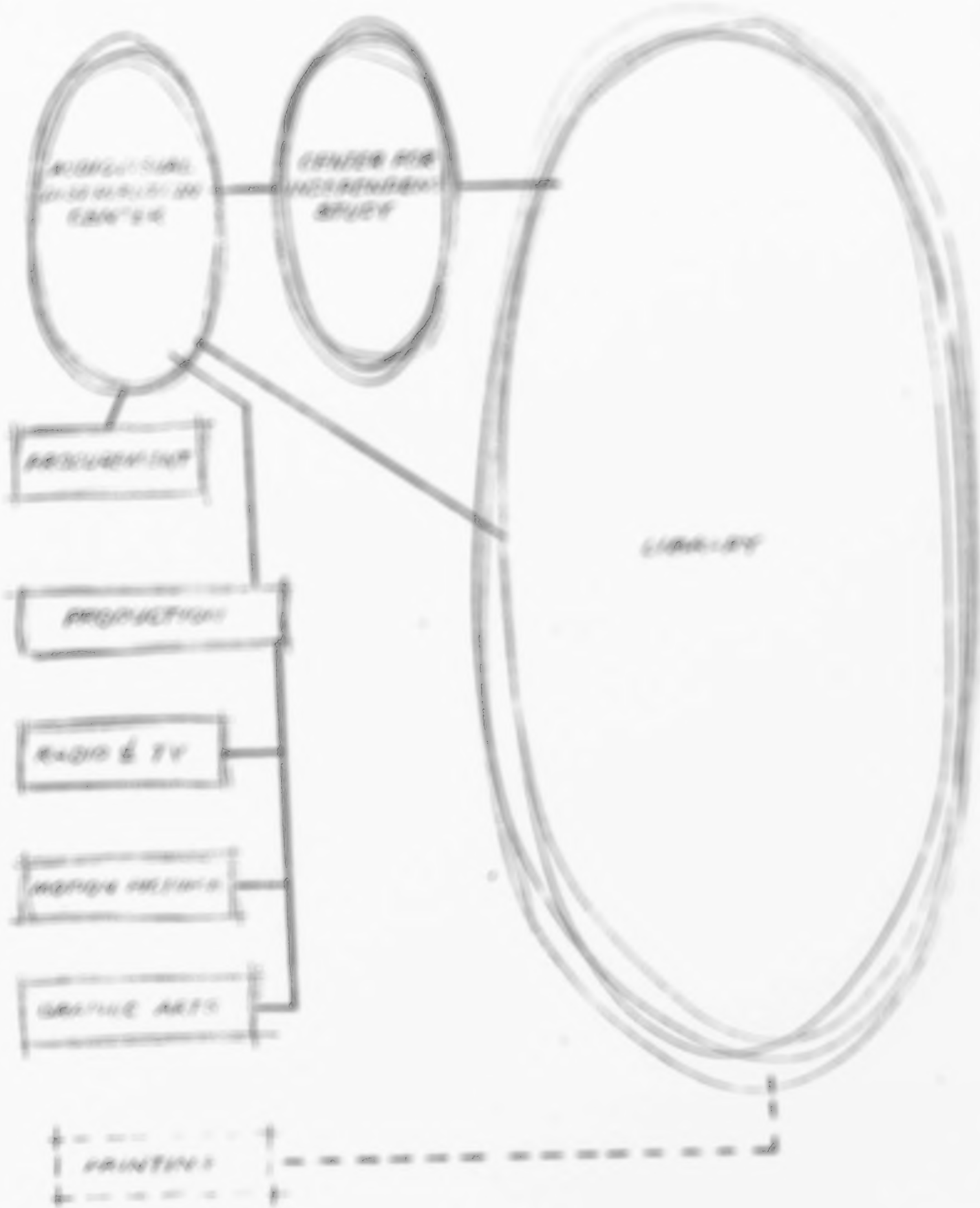
Scenery Construction and Model shops

Central Engineering Control

Mechanical Equipment Rooms

Materials Processing
....Accessioning
....Cataloging
....Indexing
....Labelling
....Mounting
....Binding
....Packaging
....Purchasing
....Reference Services
....Bibliographic Services

In addition to these service function spaces, consideration should be given to the combined personnel facilities (lavatories, lounges, eating accommodations) when the building required a large number of operating staff during twelve-plus hour days and weekend service.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Chapter III

EVALUATION AND CENTERS FOR INDEPENDENT STUDY

In the usual college setting, the Office of Testing Services performs functions to assist the faculty and administration in matters relating to measurement of the academic progress of students. The function most closely identified with this service is that of administering various tests, e.g., pre-registration or admission tests, placement tests, advanced placement tests, or tests for related service areas. This office also provides consultant services to the faculty for the purpose of refining test items to improve their form and content and to insure consistency with course objectives and the use of good evaluation procedures. The Office of Testing Services, in such instances, handles the final editing, machine scoring and statistical analysis of student test performances.

LIMITATION OF PRESENT RESEARCH

The use of new media has prompted a great deal of research in school and laboratory settings. The 1969 Encyclopedia of Educational Research, for example, summarized the findings of some 300 studies, many of which were conducted in the colleges and universities. Title III of the National Defense Education Act has prompted still other research with regard to modes of teaching machines, films, book formats, and other media in instructional programs in higher education.

The advent of new media in the college educational program require broader services. The Testing Service and new Center for Independent Study are involved with the evaluation of the wide range of student behavior that will be clearly identified using these new methods, techniques, or procedures. Faculty involvement with evaluation procedures employed in using new media in the college setting provide opportunities to share the skills in developing the many evaluation techniques for a wide variety of objectives. In some institutions the expansion may be so great the a new additional unit, a Center for Independent Study, may be needed to help faculty provide programmed learning materials and proficiency examinations for credit by examination.

It is the purpose of this chapter to provide an orientation to the role of behavior assessment in the college instructional program. The question is raised as to how the characteristics of a wide range of student behaviors can be evaluated in the instructional sequence utilizing the new media e.g., television teaching, teaching machines, programmed teaching through the use of computers, and book formats, and the extent to which the faculty becomes involved in developing criteria to measure and appraise behavior.

The most obvious conclusion that can be drawn from the reported new media research studies is that there are many new approaches to instruction in higher education. Not everyone, however, is satisfied with the

research that is being done. Norberg points out, for example, that the most frequent criticism of media experimentation and of related claims regarding their effectiveness generally fall into two categories: (a) those stressing the lack of an adequate theoretical framework to guide their use, and (b) those pertaining to measurement criterion specification, i.e., adequacy of an individual's performance with respect to specified standards. (8)

There is, as yet, nothing that approaches what might be called a "complete science of learning." The problem is acknowledged by Spence (37), Gagné (20), and Nelson (28). To compound this problem, there is a wide divergence of opinion between experimental psychologists working in the field of behavior and educational psychologists interested in the processes of classroom instruction. Glaser points out that, "there has been a significant lack of fruitful interaction between education and the developing science of learning . . . experimental psychologists concerned with learning theory and educational psychologists concerned with instructional techniques and devices have been trained in different academic worlds and in different universes of discourse." (21)

In The Science of Learning and the Technology of Educational Methods, Nelson indicates concern for closer coordination of basic and applied research and stresses their parallel relationships. (28) Glaser expresses a similar view in the AV Communication Review. "The ways in which basic science proceeds do not ensure systematic and fruitful interplay between basic knowledge, applied research, and subsequent technology . . . somebody must work at it" (18). Recently there have been encouraging signs of progress, including a number of articles (28, 33, 50) which already suggest potentially fruitful and significant lines of experimental inquiry that, to date, have scarcely been touched.

Many researchers have complained that designs to measure the comparative effectiveness of instruction deal with a too limited range of learning outcomes and fail to specify the exact nature of content or situation behaviors under investigation. In the evaluation of each new teaching method, the research question is usually, "Does this method result in more learning than does some more traditional method?" But the critical point overlooked in this question is that samples drawn to represent each method may not be representative or typical of the method. If this were true, the results would only offer data about the specific groups compared and not about the general question of which method, on the average, produces improved learning. To fully answer the question, one must sample the methods sufficiently to ensure that "average effects" are represented.

Too frequently, there is too much repetition in using comparative methods of research design. Although widely used, such study is inappropriate when little is known about some complex phenomenon. With comparative study, each of several specific conditions being compared is not the condition, it is only a sample of one condition from a population of conditions of essentially infinite variation. Thus, what is most needed in the beginning is a parametric rather than comparative study. It is

essential to know what is being compared in order to make meaningful comparisons. Little or nothing is known in the comparative design unless insight is obtained as to the nature of the population of variations. Once enough is known about this population, it may become apparent why a comparative study could not possibly produce results leading to useful decisions. If anything is known, it is that a comparative study cannot produce generalizable results. (Ph) A repetition of such a study could produce just the opposite results, since the second use of two sets of sampled conditions within some respective population might be an opposite extremes.

Because of these limitations, future studies should be designed in which the purpose is to determine the relative effectiveness of various methods, techniques or conditions. Through systematic study of these different methods, principles and conditions, it will become possible to indicate the important conditions that determine the effectiveness of instruction and instructional evaluation.

MEASUREMENT OF LEARNING OUTCOMES

Evaluation of the effectiveness of a college or university instructional program in which new media are employed raises a number of questions about student achievement. With instructional programs, knowledge of subject matter is only one of several behavioral outcomes that must be considered. Nevertheless, the remarks in this monograph, will be limited to the measurement of subject matter skill and knowledge. Achievement measurement, therefore, can be defined as the assessment of criterion behavior, i.e., adequacy of an individual's performance with respect to specified standards. When used in this context, the term criterion does not necessarily refer to end-of-course behavior. Rather criterion levels may be set up at any point in the instructional sequence, e.g., entering, auxiliary, and/or terminal, where it is necessary to obtain information as to the adequacy of a student's performance.

With this in mind, it has been shown to be more convenient to distinguish among entering, auxiliary, and terminal behaviors. (12) Entering behaviors are those with which the student comes to the instructional situation; auxiliary behaviors are those caused by instructional procedures and utilized in reaching desired educational goals; terminal behaviors comprise those specified final sets of behaviors with which the student is expected to leave the learning situation. Glaser has stated that the process of reaching a desired educational objective is facilitated by determining for each of the stages the subject matter stimuli (i.e., words, symbols, etc.) to which the learner must respond and the kinds of responses each requires, (i.e., solving problems, writing, etc.). These activities have been specified as kinds of overt behaviors, thus providing bases for obtaining appropriate feedback information for the teacher or teaching device used in instruction.

The importance of measuring the entering behaviors has been expressed by Glaser and Carpenter (17, 6). They emphasize that the assumption students in any classroom are roughly comparable in aptitude, achievement,

and background is far from true. If these differences (e.g., previous achievement, prerequisite knowledge, application of past knowledge, and motivation) are large, a regular sequence of instruction might seem altogether too rigid with even a highly selected student body. Since a programmed instructional sequence is geared to the individual, the level at which a program begins is critical and must be based on careful assessment of "entering behavior."

The assessment of auxiliary behaviors during the learning sequence is still being investigated. Schutz and Baker at the Arizona State University, for example, are currently working in this area with elementary school children and have not published their findings at the present time. These behaviors are, however, directly related to learning theory and to the wide separations between experimental psychologists concerned with total behavior in a learning situation, on the one hand, and educational psychologists concerned with instructional techniques, on the other. Most of the findings from the work being done or reported in this area, however, on teaching machines and programmed learning seems to apply to response, reinforcement, interference and transfer, practice, reasoning and understanding, and motivation.

Numerous studies of terminal behavior reflect the great interest in research on this subject. Chausow (at Chicago City Junior College) has stated that, because of their nature, these behaviors constitute the educational goals of the instructional procedure. The first step in determining their nature is to have the instructor or the subject matter specialist define desired observable terminal behaviors. The question must be asked: What kind of behaviors (perhaps test performance) does the instructor or subject matter specialist wish students to display as proof they "understand" the course material? When these terminal behaviors have been specified, it then becomes the task of the educational technologist to determine what combination of educational experiences will produce this result.

A distinction is often made between "content" and "behavioral" objectives, despite the fact that content objectives can be stated in behavioral terms. Such emphasis on behavior, or behaviors, reflects the realization that one may only infer that students possess the knowledge, understandings, abilities, skills, attitudes, ideals and appreciations involved.

An objective of science instruction may be "applying general principles in solving novel problems." This is the kind of objective that definitely needs to be related to the content, or content objectives, of instruction. Such objectives include some specification as to the general principles students are to be expected to understand and apply. They also include some specification of what problems are to be discussed in class so as to show students how to apply a particular general principle. If the principles to be applied to novel problems are identified among the content objectives, other content objectives should specify what technical terms will need to be understood and what facts will need to be assimilated. It is possible also that when the science objective is thought of in terms of what the

student *will* do, rather than what he *can* do, the list of behavioral objectives should include the identification of relevant attitudes.

Under the usual conditions of a full-time teaching load, a faculty member seldom has time to make these explicit formulations of objectives for a course. The course, therefore, tends to develop as he teaches it, following a somewhat vague outline of objectives and taking part of its shape from available textbooks and materials. Since college teachers usually are content specialists, their courses tend to develop around organizing principles related to specific elements of content rather than around principles derived from broader behavioral goals.

It is logical to organize an outline of the content of instruction or a list of content objectives to indicate the order in which the content is to be taught. A course outline also lists the behavioral objectives which can be classified under the heading of knowledge or understandings. The *Taxonomy of Educational Objectives* (TE) is a good source of information with respect to the classification of behavioral objectives. Another important source of information concerning classification of instructional objectives is *Basic Principles of Curriculum and Instruction*. (PBI)

Chart I is an example of a kind of a tableau grid currently in use in the Chicago City Junior College. In the left margin are listed designations of content objectives, and the column headings are designations of

CHART I

EDUCATIONAL PLAN

Behavior / Content	General Focus	Locate and Understand Basic Assumptions	Evaluation of Evidence	Warranted Conclusions and Generalizations
Course Outline				
Contrast and Compare				
1. Liberal Democracy	*	*	*	*
2. Communism	*	*	*	*
3. Fascism	*	*	*	*
4. Socialism	*	*	*	*

behavioral objectives. #'s in chart cells indicate which of the content objectives are regarded as appropriate for the development of behavioral objectives. The behavioral objectives are easily kept in mind since there are relatively few columns. The necessarily more detailed content objectives can continue for many pages, if necessary, as long as the sequence reflects the way the content is presented. Such a charge is of value not only in organizing and directing instruction but in the constructing of evaluation devices.

Another good discussion of instructional objectives and their classification is contained in The Measurement of Understanding (30). It states that "understanding clearly implies something more than the ability merely to recall facts or the ability to use skills in precisely the situations in which they have learned." (30). Intellectual skills which, according to the authors of this yearbook, should be included among the instructional objectives of a variety of subject fields are listed and are accompanied by test exercises and descriptions of other evaluation devices.

Underlying this formulation and definition of instructional objectives, it should be stated that it is without value unless it is followed in the day-to-day conduct of instruction and in evaluating the products of instruction. In addition, the formulation of objectives cannot maintain its value without revision which results from experience with its use.

Tyler, writing on the importance of organization of learning experiences, states: "Without organization, learning experiences are isolated, chaotic, and haphazard. No matter how effective an individual learning experience may be, if it is not followed up in subsequent phases, it is not likely that significant changes will take place in the learner." (40)

Evaluation of the effectiveness of instruction has raised into prominence a number of questions concerning the nature of measures of student achievement. Achievement measures, for present purposes, can be defined as the assessment of terminal or criterion behavior. This involves the determination of the characteristics of student performances with respect to specified standards. A grade is usually based upon a measure of achievement (final examination score, for example). Scores obtained from such a measurement provide two kinds of information: (1) an estimate of the degree to which the student has attained specific instructional objectives, and (2) information as to the student's relative standing among those in the group so measured. Content or criterion-referenced measures depend upon an established standard of subject matter competence, while the norm-referenced measures depend upon a relative standard with respect to the performance of other students. The important distinction between these two kinds of measure has been made previously by Flanagan (26) and Ebel (10).

Underlying this concept of achievement is the notion of a continuum of knowledge acquisition ranging from minimum knowledge to a high level of competence as noted by Glaser. (17) A student's achievement level (as indicated by his performance on course examinations) falls at some point on

this continuum. The standard against which a student's performance is compared is the behavior which defines each step along a continuum of achievement. In order to do this, the faculty member and the evaluation specialist must identify each level of achievement and describe the specific tasks a student must be able to perform if he hopes to achieve each of these knowledge levels on the continuum.

In instances where a student's relative standing along this continuum of knowledge is the purpose of measurement, there is no need to refer to performance criteria. School achievement examinations are frequently given for the primary purpose of ordering students, i.e., for comparing the performance of one student with the performance of others in the class or school. Such measures provide little information about the degree to which proficiencies measured reflect the limit of the student's real ability. All they do is indicate to the instructor that the student is more or less proficient than some other students. The measure does not tell the instructor the absolute level of proficiency of either with respect to the learning tasks involved.

Minimum levels of performance that describe the minimum amount of terminal competence the student should have to go on to the next course or unit in a sequence must be specified. When thought is given to the purposes of effective achievement measurement and the precepts of effective instruction, the kinds of information made available through the use of <u>criterion-referenced</u> (rather than norm-referenced) measures are seen to be necessary and useful.

Evaluation instruments used in the instructional program must be based on the objectives of instruction. The content or criterion objectives defined in course outlines become topics to be covered in the course. These outlines become references when writing test items; they insure that items are representative of the important knowledge students should acquire during the course, and thus be a justifiable "proficiency examination" for the course.

PROPOSED EVALUATION PROGRAM IN THE CENTER FOR INDEPENDENT STUDY

The Office of Testing Services provides important services to the faculty by aiding their preparation and administration of examinations for learning experiences utilizing the new media. These services will be dependent upon many factors, e.g. type of medium used, sophistication of the equipment, budget, and physical facilities.

Services offered by the evaluation specialist would be intended to assist faculty members in acquiring skill in test construction. Such efforts should result in the production of tests having even distributions of items for major course objectives, a variety of types of questions and simple, clear instructions concerning expected types of student responses. Essay tests would have clear criteria for evaluation. In addition, the faculty member would be able to use item option analyses to determine their difficulty and discrimination power.

The evaluation program for a Center for Independent Study should be planned to accommodate changes in technology and the rapidly increasing student enrollments. One way to adapt to such changes is to use a modular plan. Using such modular units permits institutions of higher learning to standardize and grow in a prescribed and planned manner.

The evaluation program, a specific service requiring controlled conditions, should be developed as a unit within the Center for Independent Study and with additional modular units as the service expands and/or changes.

These consultation services require, therefore, the following facilities adjacent to the Center for Independent Study. These facilities are presented for student enrollments of 1,500, 5,000, 10,000 and 15,000, with the lower division and upper division students equally distributed at each level.

1. Test development rooms. Much of the initial discussion, planning, revising, and general preparation of tests will be performed here. The space(s) provided should be flexible so that faculty members can work alone or in groups. A conference table and chairs or any other arrangement conducive to the purpose of these rooms would be needed.

   The faculty should have easy access to these rooms, but they should be reasonably private to insure concentration so that the faculty member makes sure that his examinations reliably measure the objectives of his course.

   The following formula based on rising student enrollments, is offered as a tentative guide to the number of required test development rooms:

Enrollment	No. of Required Test Development Rooms
1,500	1
5,000	3
10,000	5
15,000	7

2. Program Tryout Room. The working relationships among various services augmenting the instructional program are frequently overlapping. To integrate them into an ideal instructional program, a program tryout room should be available for (1) faculty use for test administration, (2) experimental programs, (3) demonstrations to new faculty and to people in the community. This room should be sufficiently large to serve these several functions. Its mechanisms and physical accommodations should be similar to those contained in the main operating unit of the Center for Independent Study.

Growth in student enrollments would not affect the need for a Program Try-out Room as directly as other units. The room must, however, be sufficiently flexible (e.g., equipped with conduits and coaxial cable) to accommodate future technological changes and adaptations based on research findings.

3. Testing Room. After finishing a unit or a complete program of instruction, students should be permitted to take the appropriate criterion examination. The testing room should therefore be adjacent to and have controlled access from the larger Independent Study Center. It should have individual testing carrels that reflect the sophistication of equipment presently in use, allowing, at the same time, for future refinements in automated teaching, testing, and scoring. Soundproofing materials should be used to insure a quiet atmosphere, conducive to concentration. To accommodate future growth in student enrollment, the testing room should also have approximately 25% the number of stations as does the study unit of the Center.

4. Scoring Room. A scoring room is an important facility for the Independent Study Center. It provides a means of obtaining immediate feedback of results of examinations to students and faculty. Tests used could be automatically scored by the usual methods if they were the objective type, using printed answer sheets or cards. Also, the Pressey punch-board could be used as the scoring medium by the student for immediate feedback. With more sophisticated equipment different response indicators (e.g., console keys and light pencils) might be used. The scoring room should be adjacent to the testing room to expedite the return of test results. As in the case of the Program Try-out Room, this unit will not be noticeably affected by the growth in student enrollment. It will, however, have to be planned so that it may adapt to the new technical innovations that will be designed.

5. A Storage Room. A storage room should have the complete test file for each course and the necessary scoring media. It should be located behind or adjacent to the control desk. To insure security of materials, tests and response devices would be given out and collected at this station.

6. Staffing. The staffing formula for the evaluation program should provide one full-time evaluation specialist for each 5,000 students, an additional person (devoting one-half time to this service) as enrollment reaches 7,500 and another 12,500. A psychometrist should be employed to assist in the Program Try-out Room and the Scoring Room. Graduate students also can be used to dispense tests and response indicators and to supervise activities in the Storage Room.

SUMMARY

The approach that should be used in instituting the total learning resources plan must be inter-disciplinary in nature. The subject-matter specialist should write the programmed courses and criterion examinations with training and counsel from others. Assistance should be provided to the content people in planning, experimental designs, tests and measurements, and production services. This endeavor adds up to a massive effort by a group of highly motivated people with different competencies. (6)

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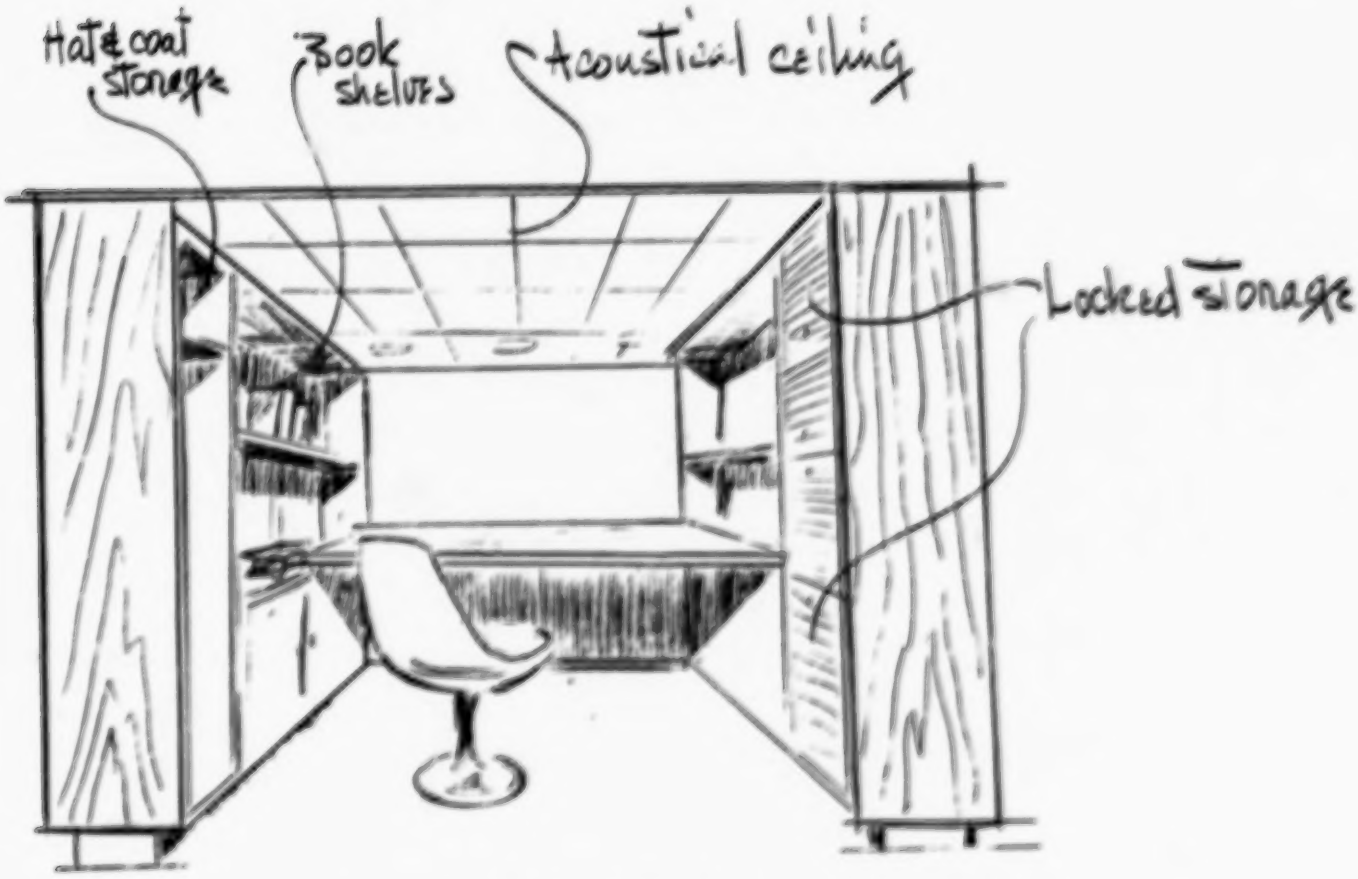
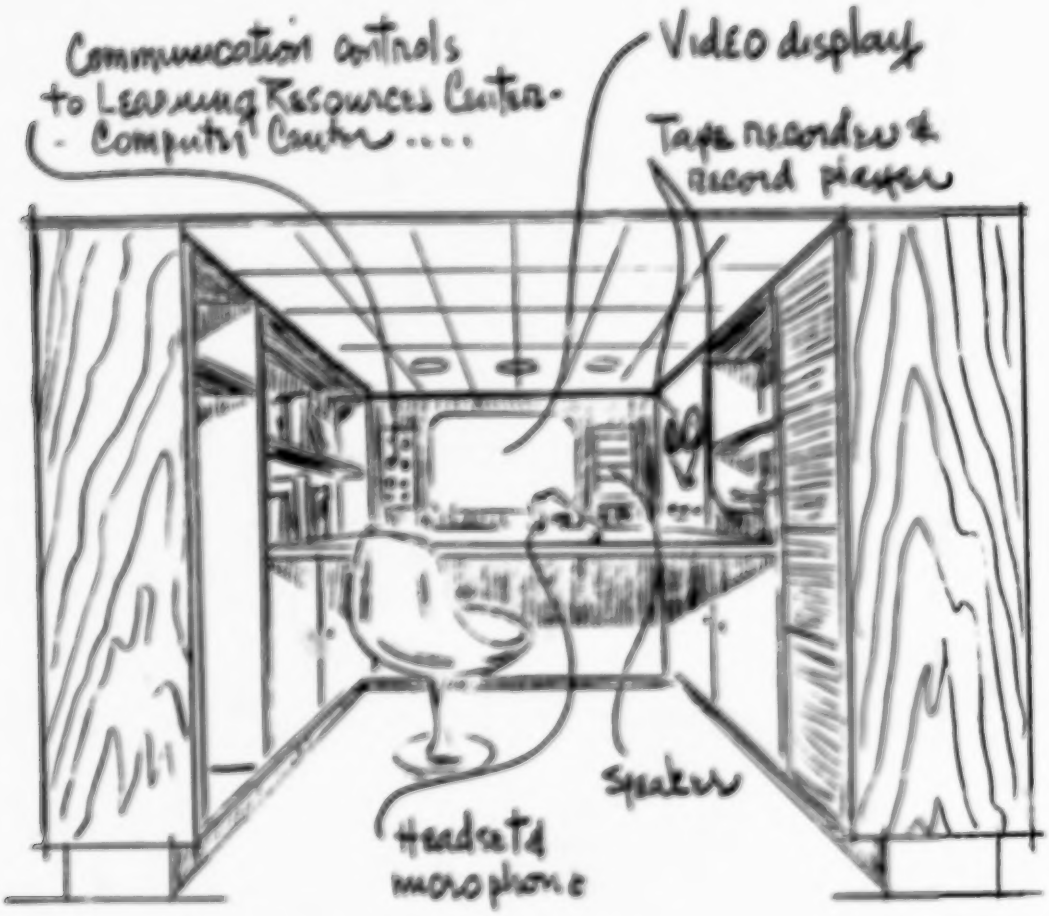
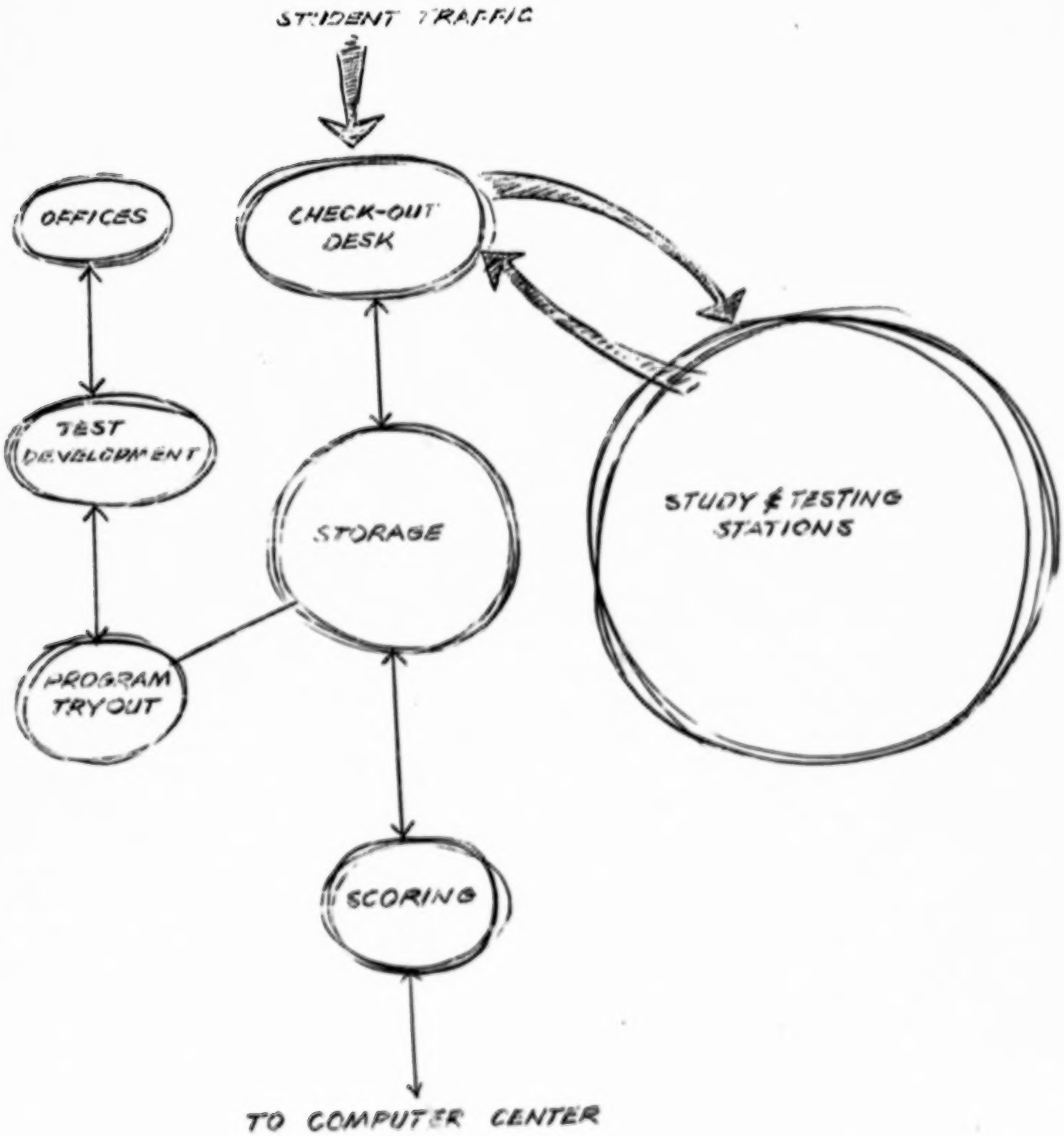


BASIC STUDY CARREL



AUTOMATED STUDY CARREL

CENTER FOR INDEPENDENT STUDY



Chaper IV

MATERIALS PRODUCTION SERVICES

INTRODUCTION

New concepts and configurations in the function, organization, and administration of those units in a college or university providing information and instruction have also increased demands for many kinds of graphic and photographic materials. Applications of technology and new media in various instiutuional programs require that a variety of high quality materials be available when needed, and produced at reasonable cost. Demands for these materials will continue to grow with the increase in size and diversity of institutions and their programs. Some institutions provide competent materials production services to their faculties and staffs. They have found that faculty and staff recognize the value and convenience of such service and demands for service increase at rates more rapid than the increase in size of faculty and student body.

FUNCTION OF MATERIALS PRODUCTION SERVICE

To meet demands for graphic and photographic materials, some agency for their production must be an integral part of any learning resources center. However, the function of a materials production unit can and should go beyond the servicing of just the instructional program. The materials production unit should be organized to serve the following programs:

- The Instructional Program
- The Administrative Program
- Non-Instructional On-Campus Programs
- Off-Campus Instructional Programs (other than credit courses)
- In-Service instruction and information Programs
- Community Services offered by the institution
- Other institutional Services
  - Television Production
  - Motion Picture Production
  - Audiovisual Services
  - Independent Study Center
  - Library
  - Public Relations
  - Publications

The Instructional Program is the regular program of credit courses that are listed in the catalog, and the activities directly connected with them. They may be offered on campus or off, through extension centers, or as otherwise provided.

The Administration Program includes those functions necessary to the administration and operation of the institution.

Non-Instructional On-Campus Programs include concerts, dramatic performances, athletics, and similar activities that are part of the regular college program.

Off-Campus Instructional Programs, other than credit courses, include activities such as workshops carried on by the institution for civic organizations, local government agencies, school systems, business or industry.

In-Service Instruction and Information Programs are the various programs the institution establishes to instruct or inform its own faculty and staff.

Community Services are the services, such as consultation or research, the institution makes available to the community.

Television Production includes the whole range of production from a single closed circuit lecture to a full scale dramatic presentation for general broadcasting.

Motion Picture Production includes the whole range of production from a single concept, 8mm film to a full length sound motion picture.

Audiovisual Services are those services dealing with the procurement, storage, distribution, and maintenance of audiovisual materials and equipment.

The Independent Study Center includes those areas and programs organized to assist students in independent study and learning. There may be several facilities on the campus set aside for this purpose.

The Library includes all those functions dealing with the procurement, storage, and distribution of whatever learning materials are included in its collections. These collections may be housed in several places on the campus.

Public Relations refers here to the organized public relations program of the institution.

Publications includes books, pamphlets, bulletins, etc. produced by the institution. It does not include the school newspaper, annual, or similar publications. These are student functions and should be the product of student rather than professional work.

Materials Production Services should be capable of providing the institutional programs with the following services:

Production
Reproduction
Design
Consultation
Planning of Learning Materials and Instructional Systems
Experimentation and Development
Research and Evaluation
Demonstration

Production Services should be able to product the following original materials:

Photographs, black and white, color
Slides, black and white, color
Filmstrips, black and white, color
Overhead projection materials
Drawings
Illustrations
Cartoons
Charts, Maps, and Graphs
Displays and Exhibits
Set and Costume Design
Lettering
Animation
Models, two and three dimensional
Motion Pictures, (If there is no motion picture production unit on the campus materials production should be capable of doing some work in this area).

Reproduction services should be capable of reproducing, duplicating or copying any graphic or photographic material. These facilities should not be used to reproduce materials that are otherwise available unless the cost of time and materials can be justified. Reproduction services are often asked to reproduce materials that can be purchased at a cost that is lower than the cost of reproduction.

Duplication for multiple copies, such as instructional handouts for students or office forms, can be done by Reproduction services, but equipment for this service should be provided in addition to the equipment used in the other phases of production.

Design service provides designs for materials which may be produced by Prodction service or may be turned over to some other agency for actual production. As used here, the term "Design" means the creation and organization of the physical, visual structure of the material to be produced.

Consultation service provides consultation and advice relating to materials, their availability, their use, and their production to persons responsible for carrying out the various institutional programs.

The trend in using instructional materials is toward integrating them into systems of instruction rather than using them casually or optionally in learning situations. In such cases, the Materials Production Services can make major contributions to the improvement of instruction by being directly involved in their planning and in helping to organize them into instructional or communication systems.

Experimentation and Development are services Materials Production provides for itself. The unit should be constantly engaged in experimentation with new materials, methods, and equipment. It should be developing new methods and structures. From these experiments will come still other new materials and media, as well as new configurations of older materials and media.

Research and Evaluation provide an organized and valid way to study the many problems related one way or another to the production and use of graphic and photographic materials. Provision for research and evaluation enables Materials Production to build a body of information on which the production and use of materials can be based.

Materials Production Services should have space and facilities to demonstrate materials and methods of using them. This space can also serve as an experimental classroom in which materials and methods can be tested and evaluated in actual use with students.

ORGANIZATION

In some institutions, because of their size and their multiplicity of functions, it has been considered necessary to organize several on-campus agencies to provide materials production services to serve various needs. Areas to be served are divided according to function, (e.g., the Instructional Program, the Administrative Program); each functional area that requires one has its own production unit.

It may be that size and diversity make such arrangements inevitable; but several agencies providing similar services will also lead almost inevitably, to wasteful, expensive equipment, facilities, and personnel.

The increasing difficulty in obtaining adequate educational budgets suggests, if not demands, that colleges and universities make every effort to eliminate such unnecessary duplication.

But differentiation of demand does not necessarily require separate materials production services. In fact, organization of facilities and personnel in a single production unit makes it possible to bring all or part of the total campus production capability to bear on any facet of the institutional program. The ebb and flow and variety of demand can be easily handled by assignment of equipment and personnel within the production unit itself.

It is true that the requirements of the Instructional Program, for example, are different from those of the Administrative Program and the requirements of the individual units within the programs also differ. This suggests that it might be more efficient to provide separate service units for each separate function area. However, from the standpoint of the physical production of graphic or photographic materials, the intended purpose is not significant. A set of slides, for instances, requires the same technical operations to produce it whether it is to be used for student instruction or public relations.

Once an institution has committed itself to providing materials production service for its various programs it must be prepared to adequately support the operation. The success of the service depends on adequate personnel, equipment, physical facilities, and financing. The number and kinds of personnel and equipment may vary with the size

of an institution and the number of programs to be served, but if the institutional programs are to be provided with the services described here there are minimums of personnel and equipment that are necessary. A production unit must have, as a minimum:

A Director
A Secretary
A Photographer
An Artist

The Director is the administrative head of the unit. He is responsible for the organization of the unit, the assignment of work, purchasing, budgeting, and similar functions. In a small, or newly organized unit the Director also acts as consultant to the other college units.

He should have experience in actual classroom teaching, both elementary and secondary as well as on the college level, public relations, and administration. The Director must have a working knowledge of the various production processes, and preferably should be skilled, himself, in either graphics or photography, or both.

The Secretary is responsible for the various office procedure such as typing, filing, etc., and the taking of orders for production services. She should be competent in all the office skills and be able to deal with the unit's "customers" with tact and intelligence.

The Photographer must be a well trained, experienced professional. He must be capable of handling any photographic problem from simple copying and picture taking to complex darkroom production techniques.

The Artist must be a skilled, experienced, well trained professional, able to do anything in the field from key line and paste up to illustration and animation.

The Artist and Photographer serve as professional consultants to the Director.

The simpler, routine operations such as LeRoy and Varigraph lettering, copying, or mounting can be done by student assistants, permitting the Artist and Photographer to concentrate on the work requiring their professional skill and experience. It is sometimes possible to find students who have photographic or artistic skills. However, these skills are very rarely at a professional level. Since students' prime responsibilities are to their classwork, they cannot always be available when needed, and the turnover due to graduation, transfer, and changes in program each quarter or semester makes student assistant time too variable to be depended on to carry the main work load of a materials production unit. It is a serious mistake to think that because a school is small, or that a production unit is new, it is not necessary to employ full time, professional personnel.

As demand for production service increases additional personnel will

be required. The point at which personnel should be added must be determined by the department's work load and the number of man hours required to carry it. The kinds of skills needed will be determined by the kinds of work the unit is asked to perform.

It would be a relatively simple matter to work out a staffing formula based on an arbitrarily fixed ratio between student enrollment, size of faculty and staff, and personnel in the materials production unit. However, this does not produce an accurate or functional basis for determining the point at which additional personnel are needed nor the number of personnel needed. The important factor in determining staff is the actual amount of work the unit is asked to produce.

At California State College at Hayward the number of requests for production service during the 1963-64 school year increased three times as much as the number of faculty and students. As the faculty and staff found that they could easily and conveniently obtain high quality materials, designed and produced to serve their specific purposes and available when needed, demand for service increased at an accelerating rate. The type of work requested changed from simple copying to the creation of more complex materials requiring professional skill in graphics, photography, and related fields. The increase in the complexity of materials produced, and the growing desire on the part of an increasing number of faculty members to develop instructional systems to replace the occasional or coincidental introduction of materials into the learning situation required a corresponding increase in the time spent in consultation and planning. Since no record of planning and consultation time was kept during 1962-63, no accurate comparison can be made, but a survey of the kinds of work requested indicates that considerably more time was spent for these purposes in 1963-64 than in the previous year.

From his own experience and from conversations with others in charge of production units in other institutions, the writer believes that there are great latent demands for materials production that become known as services to satisfy them are provided. No institution, to the writer's knowledge, has ever been able to completely satisfy this demand, and its full extent and nature can only be estimated and speculated upon. However, the existence of latent demand is evidenced by the fact that as new naterials and new services are made available they find an immediate and growing number of consumers.

Since potential demand can only be estimated in advance of actual demand, bases for staffing, equipping, and financing materials production units must be sufficiently flexible to adjust to actual and developing requirements for the unit.

To the writer's knowledge there is no other institution in the country with a single production unit serving its full range of functions serving all facets of institutional operation.

Thus, only time and experience will produce accurate data upon which to base staffing, equipping, and financing policies for such a unit. It is also to be expected that the point at which additional staff, equipment, and budget is necessary will vary with each institution and the demands it makes on its production unit. But if a production unit is to obtain and hold competent, professional personnel, salaries must, at least, be competitive with those for similar jobs in industry and commerce.

PRODUCTION EQUIPMENT

To provide the services and produce the materials listed here, Materials Production Services require the following equipment:

PHOTOGRAPHIC

2 35mm cameras and lenses
1 2¼" x 2¼" camera and lenses
1 4" x 5" studio camera and lenses
1 8" x 10" studio camera and lenses
1 4" x 5" press camera and lenses
1 8" x 10" copy camera with vacuum back and lenses
2 Enlargers
1 Print washer
1 Print dryer
1 Negative dryer
1 Contact printer
Developing trays, tanks, clips
1 Spotting table
Safe lights
Studio lights, spots, floods
Poles and standards for lights
4 Camera tripods
2 Light meters
Slide and slidefilm copier
Darkroom and film supplies
1 8mm sound motion picture camera
1 16mm sound motion picture camera

GRAPHIC

Diazo process equipment (Ozamatic 60 or equal)
Photocopy equipment (Copease or equal)
Mounting press 18" x 20" minimum
Paper cutter 30"
Headliner (Varityper or equal)
Varityper typewriter
Primary typewriter
Fine and coarse airbrushes and tank or compressor
Leroy lettering equipment
Varigraph lettering equipment
Brushes, pens, pencils

T-squares and triangles
Drawing instruments
Art and drafting supplies
2 Drawing tables 48" x 72"
Stools
2 Work tables (36" x 60" At least)
Files
Storage cabinets
Woodworking tools and equipment
Overhead projector
Opaque projector
TV set
2" x 2" slide projector
Slidefilm projector
Refrigerator

All equipment must be of high quality, designed for professional production work. Purchase of improper equipment unnecessarily limits the production service. It may be argued that, due to budget limitations, high quality equipment cannot be bought and that, under the circumstances, "something is better than nothing". But the cost of producing materials with ill-suited, poor quality is considerably higher than that for producting the same materials with proper quality equipment.

It might also be argued that, for a small or newly-organized unit, all equipment listed here would not be needed. It is true that materials can often be produced by hand or by primitive methods, but use of these methods usually wastes time, effort, and money.[1]

HOUSING

Materials Production Services require space for the following types of work activities:

Office
Conference Room
Photography Studio
Two Darkrooms
Graphic Studio

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1. A machine such as the Varityper "Headliner", for example, can be operated by a student who may be paid only $1.50 per hour. With it, a line of type can be set in minutes, whereas to product a line of equal quality by hand-lettering methods would require two or three hours ofof work by a professional artist at a cost of at least $4 per hour. Thus, an original cost of only $2,000, and a working ligr og 20 years, the machine would soon pay for itself.

The office is the work space for the Director and the Secretary. This is the place to which those persons using the production services would come to place orders and pick up materials. The room has space for the Director's and Secretary's desks and whatever storage and filing units are necessary.

The photography studio is the space where materials requiring a studio set-up can be photographed. This is also the space where copying cameras and tables can be placed. It should provide space for the storage of lights and light poles.

Two darkrooms are necessary, or one large darkroom that can be divided, so that both developing and printing can be done simultaneously. While it is desirable that there be a third room that can be darkened for camera loading, this can be done in one of the other darkrooms if one is not available. Space would also have to be available in these darkrooms for camera and film storage.

The graphic studio must be large enough to contain a large drawing table, a large work table, and cabinets for the storage of materials and equipment.

The following drawings illustrate the sizes and suggested arrangements of each of the rooms in relation to each other.

A LOOK TO THE FUTURE

The preceding discussion is based on requirements for present operations using current methods and equipment. But rapid changes in technology will no doubt affect both methods and equipment. It appears to the writer that within the next ten years most changes will be in the form of improvements and refinements in the processes and equipment now in existence. It may well be that truly revolutionary processes and equipment may appear on the market during this time but so far the writer has seen only refinements and improvements in already existing methods and equipment.

New equipment such as Xerox and similar devices and processes will increase the speed and accuracy of copying. Cost per copy also can be expected to go down as the equipment and processes are improved and perfected.

Photographic capabilities will be increased by recent introductions of new and faster film, better cameras, and finer lenses. Broader uses of improved Polaroid-type films and cameras will also eliminate, for some purposes, some present time-consuming darkroom procedures.

The trend toward the organization of materials into instructional and informational systems suggests that videotape may be a logical and relatively inexpensive means of recording and reproducting the entire system, in some cases eliminating the need to use slides, filmstrips, motion pictures, or overhead projector transparencies. But the need to retrieve and use individual graphic or photographic representations limits the total application of videotape for reproducing and recording materials.

To prepare for changes which no doubt will come but which cannot be accurately predicted the organization of Materials Production Services, both physical and administrative, should be flexible.

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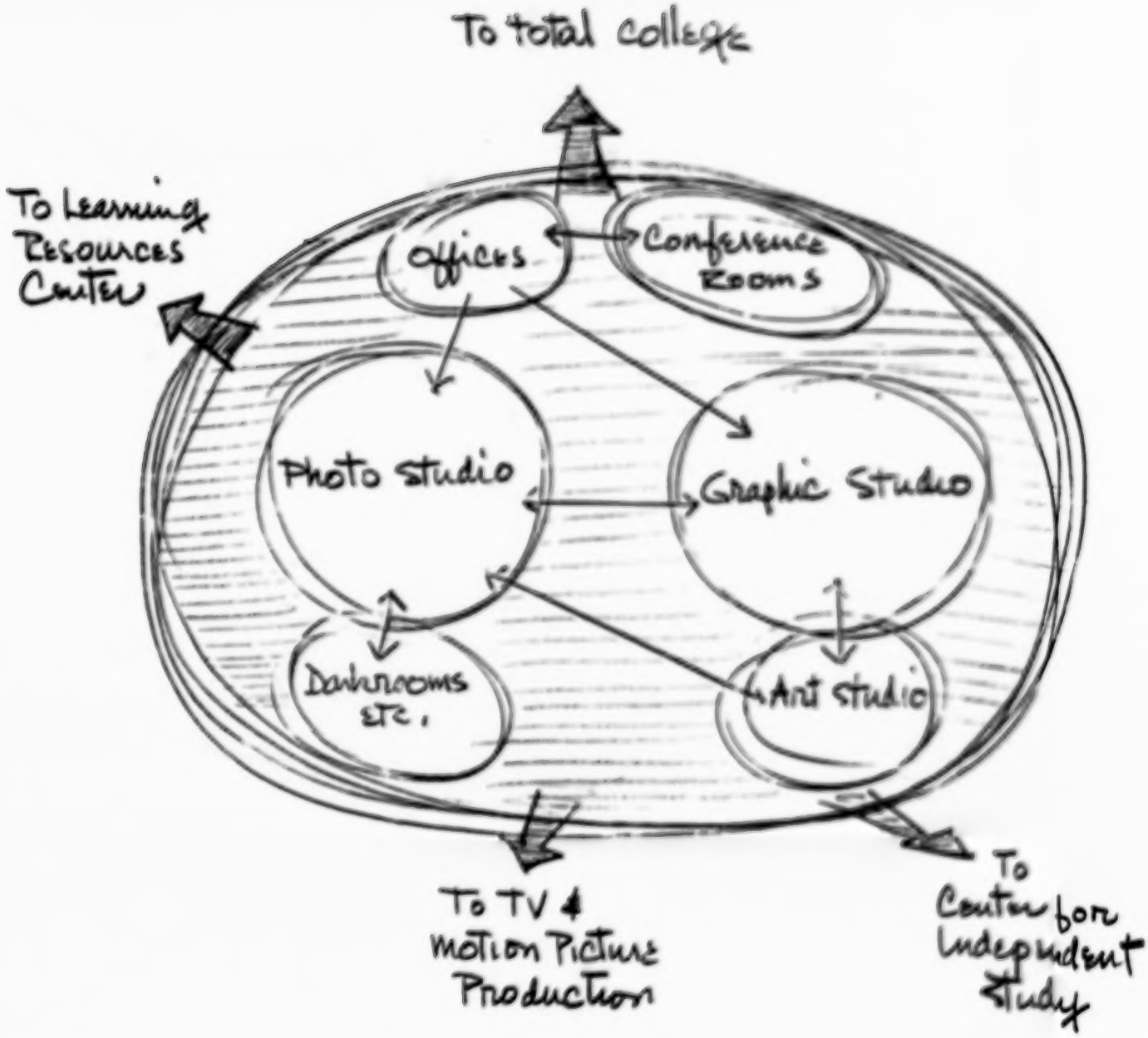
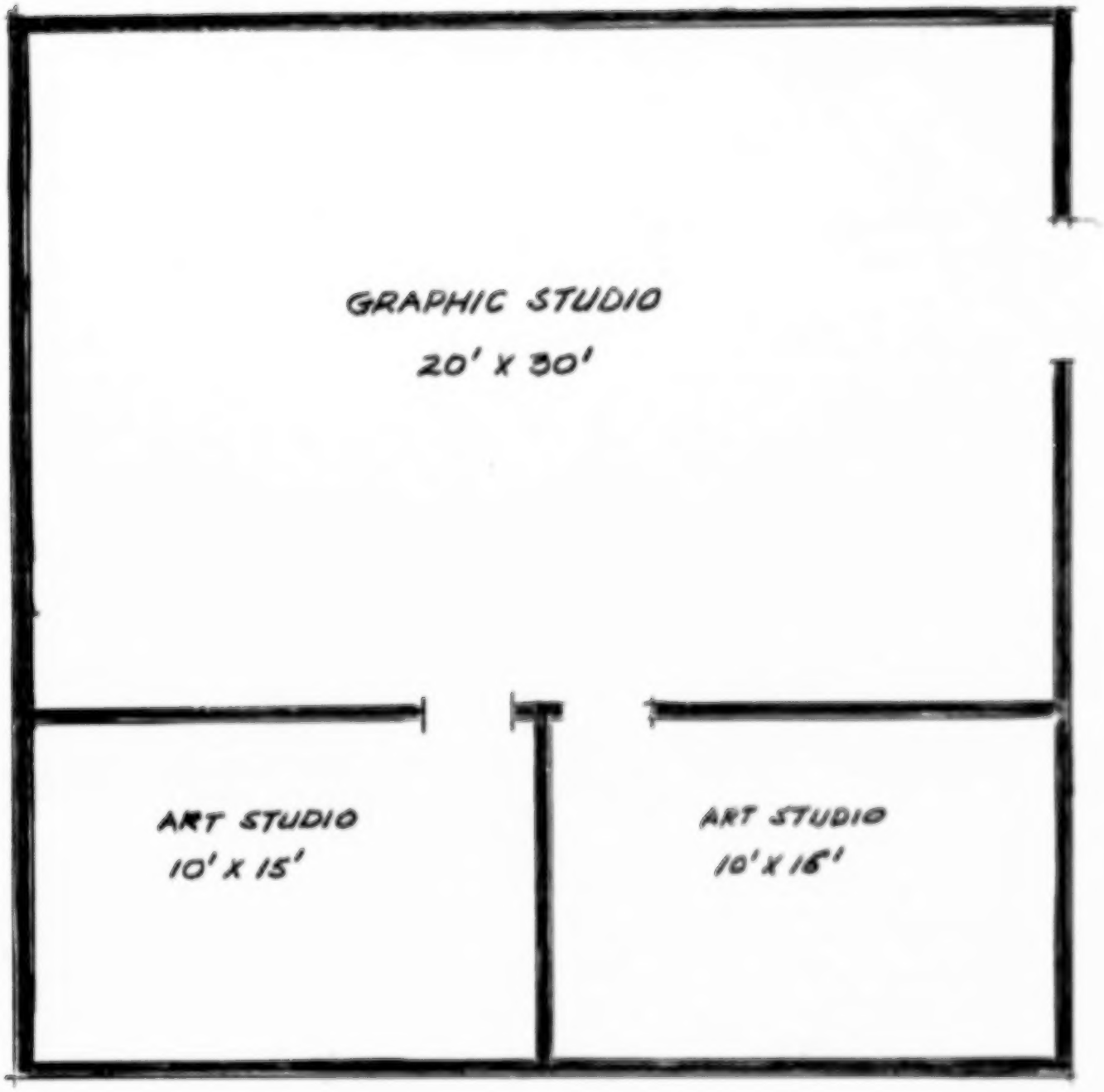
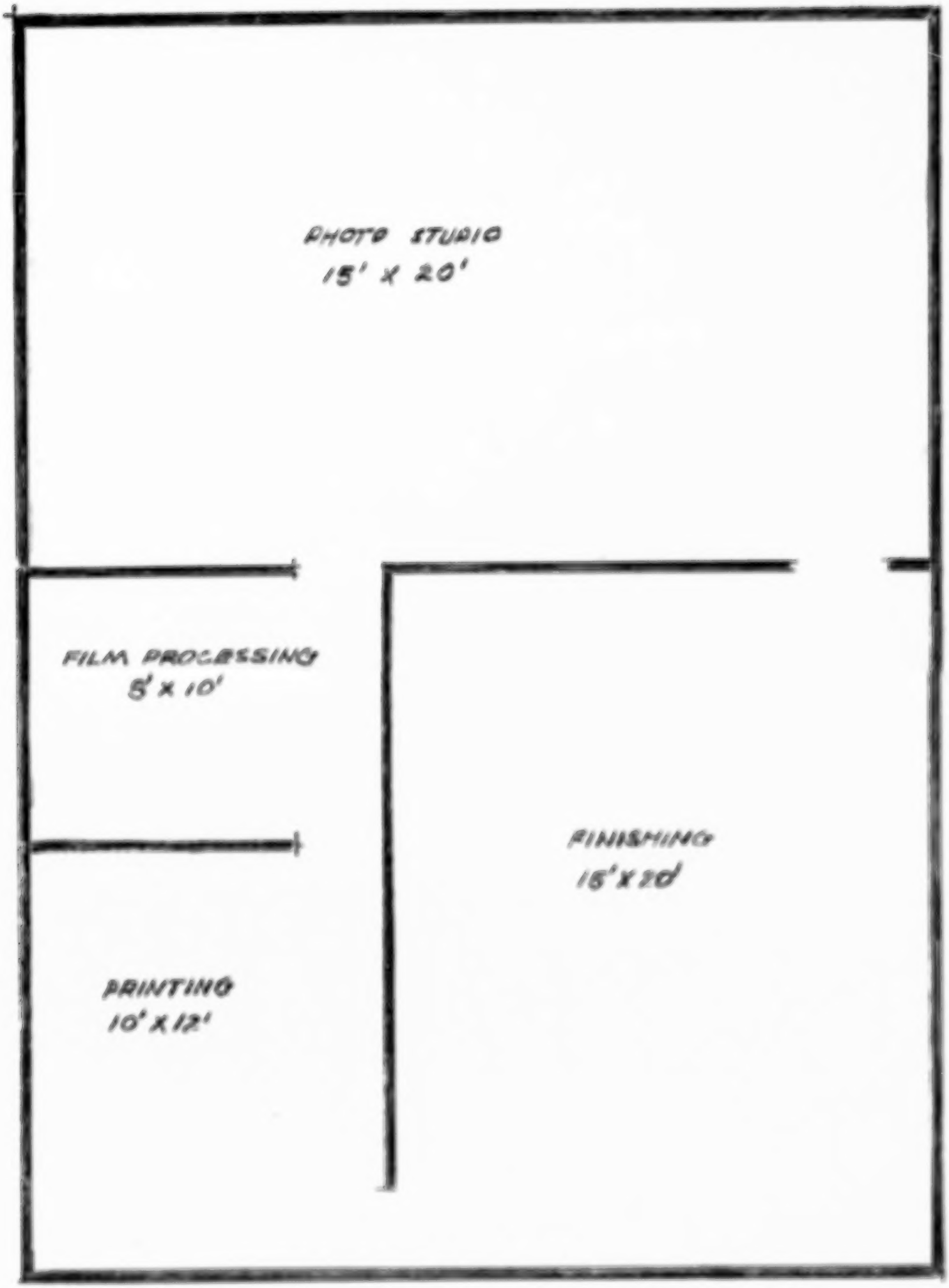


FUNCTIONAL DIAGRAM OF MATERIALS PRODUCTION SERVICES



MINIMUM ROOM SIZES FOR GRAPHIC UNIT



MINIMUM ROOMS & ROOM SIZES FOR PHOTOGRAPHIC UNIT

Chapter V

THE LIBRARY SERVICES

1. PREFACE

Today's college library is more than a storehouse of recorded information and a place for students and faculty to use that information. An effective library is the projection of a vast accumulation of resources to the student and faculty of the college. (3) In the academic society of 1964, the library is only one of the many instruments of the instruction. Teaching by television, programmed teaching via computers, programmed learning centers, carrels equipped with audiovisual reception (15), graphic production, phono-discs, tapes, and other means have existed for many years although they seldom have been integrated into an articulate unit. A coordination of these various instructional elements is vital in order to educate students effectively. (15)(28)

The effectiveness of a college library may be measured by the degree to which it makes all of its resources quickly and effectively available to students and faculty. To a great extent the instructional services areas must free the teacher from routine tasks so that he can give more of his time to teaching. All advanced systems of instruction that are economically feasible and have practical application to the program must be used. (47) The literature of automation indicates that the academic society of the future will need to accept automation in order to survive. Precisely how this will be accomplished is not certain, but there is no question that some form of retrieval system will do the monotonous tasks.

Some libraries and segments of some academic institutions are now using electronic information storage and retrieval. (37) It should be noted that retrieving information in the form of concepts from the printed page is not economically practical at the present time nor in the near future. (29)(40) Automation is now applicable to certain phases of Technical Processes and subject bibliographies are being routinely printed-out by computers in some libraries. For example, Ralph Parker, librarian at the University of Missouri uses IBM cards that are punched to represent author, title, publishers date of publication edition, number of copies, the account number and the dealer. These cards are manipulated by machines and up-date the ledgers automatically. Another example, the University of Florida which uses a similar system. (48) The circulation systems in many libraries have been automated for years in the form of punched cards, photo-charging, Addressograph, etc. The use of IBM and plastic cards in circulation systems now makes it possible to control circulation and utilize electronic scanning devices to study the circulation records statistically. Donald Block, Director, Library Operations Survey, University of California at Los Angeles urges the adoption of business practices so as to reduce library costs.

> "Take circulation records. In circulation we have something very much like inventory control. In acquisition work we get invoices from a dealer, we approve them for payment, we process them in some way, and send them on to the comp-

troller's office to write checks. Straightforward business. Has nothing to do with libraries except the fact that the materials we are buying are library materials. Many businesses automated this kind of activity years ago." (48)

Revolutionary advances that are being made in electronics are such that eventually all repetitive processes in the library can be accomplished by use of computers. This would release personnel to concentrate on other library functions. The further application of a computer will be initiated as size and complexity of the institution make it practical.

II. AUTOMATION IN THE LIBRARY

Libraries being designed today are not able to take advantage of the application of documentation and information storage and retrieval. (37)

> "Documentation and librarianship have never excited the imagination of the American public -- and small wonder -- because the documentation services of the world, when viewed broadly, are in a state of near chaos, and many of those professionally responsible are reluctant even to admit that a problem exists." (26)

At the present time an automated system for storing and retrieving information in the form of concepts from the printed page is not practical, and only to a limited degree is it practically possible to retrieve bibliographical information (3)(38) Extensive research is being done in conceptual retrieval at the Center for Documentation at Western Reserve University, Documentation, Inc., Washington, D.C., by Calvin Moore, at Zator Company in Cambridge, and in many electronic laboratories throughout the world.

Sophisticated research in the field of electronics and computers supported by ample private and government finds indicates a strong possibility that an experimental system of conceptual retrieval could now exist, although according to most existing literature the conceptual information retrieval is not now possible. In addition, the literature on documentation and information storage and retrieval has indicated a new direction: A probing into the basic facts of human methods and thinking processes resulting in the question of ability to program for information storage and retrieval. (4)

> "A large portion of the reading done by specialists is outside their specialties. There is substantial testimony that creative thought is generated, or at least stimulated, in the prepared mind by reading materials that are apparently irrevelant. Until we know a great deal more than we now do about the nature of the intellectural processes that result in creation of new knowledge it will be rather difficult for us to programme a computer to further these." (42)

Specific bibliographies are currently being printed-out although in

most instances this is on an experimental basis. (1)(9) Current research at the Center for Documentation and Communication Research at Western Reserve University indicates that conceptual information storage and retrieval is not resolved and that bibliographical retrieval is far from a practical program reality. (21)

The Council on Library Resources, established and funded in 1956 by the Ford Foundation, for the purpose of aiding in the solution of problems of libraries generally and of research of techniques in particular, cautions, "The elements of an automated bibliographic technique have now been developed, but much remains to be done to develop the common denominators of need and potential use, the standards of machine language and of bibliographic information in machine-readable form." (10)

The problem of serials with their manifold complexities are thought by some to be completely soluble by Computer Programming (44) and are making such extravagant claims as the following:

> "At Grand Valley State College, where Mr. Cornberg is installing the latest audiovisual equipment, he conducted a successful battle to restrict the size of the library to no more than 23,000 volumes. Even this many books he considers a concession to the sentimentality of the faculty. "Today's student learns more easily from a television screen than from a book," he insists. Mr. Cornberg's advice to campus planners is explicit: "...plan no more buildings for library use. The library space is a concession to the past. Don't invest in bricks and mortar." (48)

However, the Council on Library Resources urges caution, "...Because of the vagaries and complexities of serial publications, serial record work which might be supposed to involve merely clerical routines, is complicated and expensive. Innumerable attempts have been made, without success, to reduce the work to machine-like simplicity and efficiency."(10)

Mr. Melvin Voigt is now working with an automated system of serials acquisitions at the University of California at La Jolla. The Council on Library Resources is helping to finance the work because it considers the project to be experimental and to have great possibilities. (10)

The University Library Information Systems Project of the University of Illinois, at Congress Circle, Chicago, was created to investigate the possibility of a total system of mechanization of routines in a University Library. The General Electric Corporation, the Council on Library Resources,

and the University Administration were convinced that "...specialized information centers must employ new intellectual disciplines to keep pace with the rapidly developing intellectual revolution, and that they must adopt and adapt modern technology to serve the population which creates this revolution and lives in its environment." (39) This project should be watched closely (8)(9) and any feasible recommendations that result from this experiment should be considered for adoption by any college or university. Mr. Heiliger, the Librarian who was in charge of the project at the University of Illinois, is now located at Florida Atlantic University, founded in 1963, and much of the study and experimentation pursued at the University of Illinois at Chicago, is also being implemented at Florida Atlantic University. The automation program at either the University of Illinois at Chicago, or Florida Atlantic University, is likely to be a milestone in higher education.

With rare exceptions, the advances made in bibliographic and conceptual information storage and retrieval have been concerned with specific subjects. Only a few selected projects are oriented toward academic libraries. (4) The use of computers to print-out catalog cards or public catalog in book form have been made possible only because of the availability of an expensive computer that is used primarily for other purposes. The library program at Lockheed Missile and Space Company in Palo Alto, has not only a computer used for many other projects but also highly qualified personnel available. Los Angeles State College, working with System Development Corporation, has investigated the possibility of converting the card catalog to a printed catalog, but has concluded that it is not now economically feasible. A survey relative to the feasibility of printing-out a book catalog for the proposed undergraduate library at Stanford University is currently being made.

Undoubtedly the future of information storage and retrieval is beyond the comprehension of today's librarians and scientists. Information storage and retrieval literature, like the consultants who have visited the college, states that extreme caution should be used before committing the library to an expensive experimental program which might be economically disastrous.

Ralph R. Shaw, the inventor of the Rapid Selector, which was one of the earliest of all the storage and retrieval machines that actually worked, and a consultant on the DEPLAA Project, states "...Until we know a great deal more than we do now about the nature of the intellectual processes that result in creation of new knowledge, it will be difficult for us to program a computer to provide this stimulus." (41) During Mr. Shaw's visit on the campus he advocated that computers for bibliographic information storage and retrieval and certain repetitive routines in technical processes be used whenever they become economically feasible. This will depend, to a great extent, upon the availability of an adequate computer that would serve many functions on the campus. This is reflected in his sobering article of last year:

"In view of the fact that vast amounts of information are now available and readily retrievable through various devices, the outcries we have been hearing about the alleged crisis in information retrieval seems to be somewhat extreme.... We have gone astray in this field by equating improvement with change, and emphasizing the means rather than the end." (43)

Dr. Don Swanson, from the University of Chicago, has expressed great enthusiasm for the future of information storage and retrieval, but has also expressed an awareness of its many problems. (5)

The lack of experimentation in information storage and retrieval for libraries is due, to a large extent, to the apathy of most librarians and their lack of training in library schools. (19) They are ignorant of and uninterested in its possibilities for improving library service and obviously are not accepting their responsibilities. (28) Robert Hayes of Hughes Dynamics, Inc., one of our consultants, expressed serious concern over the apparent lack of interest outside the field of science in the problem of computers and information retrieval. The lack of interest -- by those in the humanities -- in directing this extraordinary potential should concern all who are knowledgeable in the field. Granted that large funds are needed for experimentation, an academic interest should be more prevalent in the library profession. Many of the librarians who are interested in automation are leaving academic institutions for special libraries in science and research where funds and equipment are available for experimentation. Librarians who have pursued research in this area, such as those at the University of Illinois at Chicago, Florida Atlantic University and the University of California at La Jolla, may prove to be the pioneers in a break through in library services that will be revolutionary in its implications. The potential should not be underestimated (38) and one should not be dissuaded by extremists on either end of the spectrum, but recognize the realistic middleground. (46) (49) (2)

III. PROPOSED MODULAR LIBRARY PROGRAM FOR A COLLEGE OF 1500 STUDENTS

Before defining the library program or considering the application of automated methods to it, one needs to know the college objectives, the types of students and faculty, and the materials required to give excellent service. The library is an effective integral part of the total college program only when it adequately reflects and implements the objectives of the college. The working relationship between the various segments of instructional resources, such as teaching via television, audiovisual services and the center for independent study must be direct and frequently overlapping. The library must be considered only as a single unit of an integrated whole. The purpose of the library in the total instructional program differs from the other instructional segments only in the type of resources available. Its purpose and function are the same. The utilization by students of the various resources from different areas within the total instructional material center for the same purpose indicates the obvious need of a direct working relation between them.

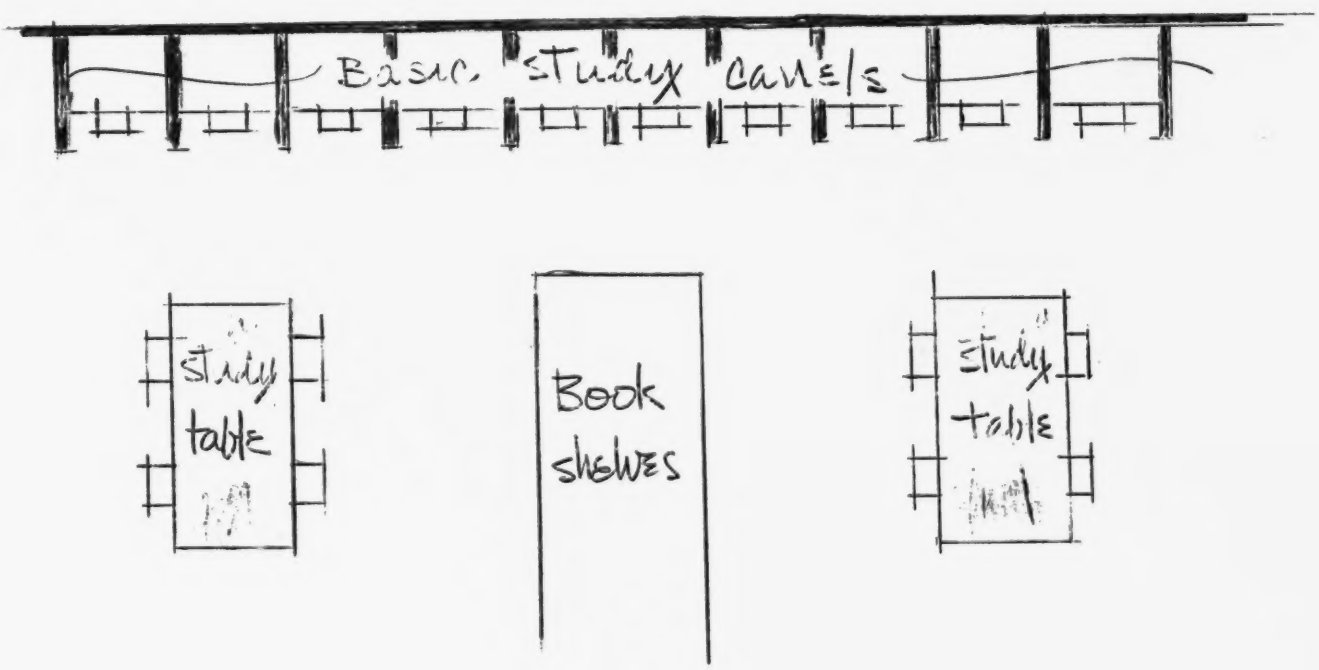
The problem of space and seating accommodations for students and faculty in the library is important. Many factors (including such items as: (1) types of programs, (2) graduate and/or undergraduate students, (3) faculty, (4) need for study halls and the relation to residence halls (5) the location of the institution and (6) student union facilities) relate to library seating requirements. (32) Each institution is different and must express its own needs. (16) Keyes Metcalf, of Harvard University states that there is no known formula for seating (33) applicable to all types of institutions.

Directly related to the objectives of the college are the types of students and faculty to be served and the necessary means to provide them optimum service. Too, it is obvious that the amount and types of instructional material, qualification of personnel, sophistication of equipment and routines, and type of attendant areas will be reflected by these objectives, in addition to size of enrollment, budget, and types of student.

Following are the projected categories of students and faculty who utilize the various library resources, facilities currently required and projected, and their logical location in the building. The latter is predicated upon traffic patterns, noise, duration of use, proximity to other departments of instructional materials, format of material, etc., all of which are qualifying factors relative to effective utilization by the total college community.

1. Work with material brought into the library.

Much of library use is by students who bring their study materials into the library with them. It is possible that these may have been checked out from the library at an earlier time, but the student's purpose in coming to the library is to have a place to study.



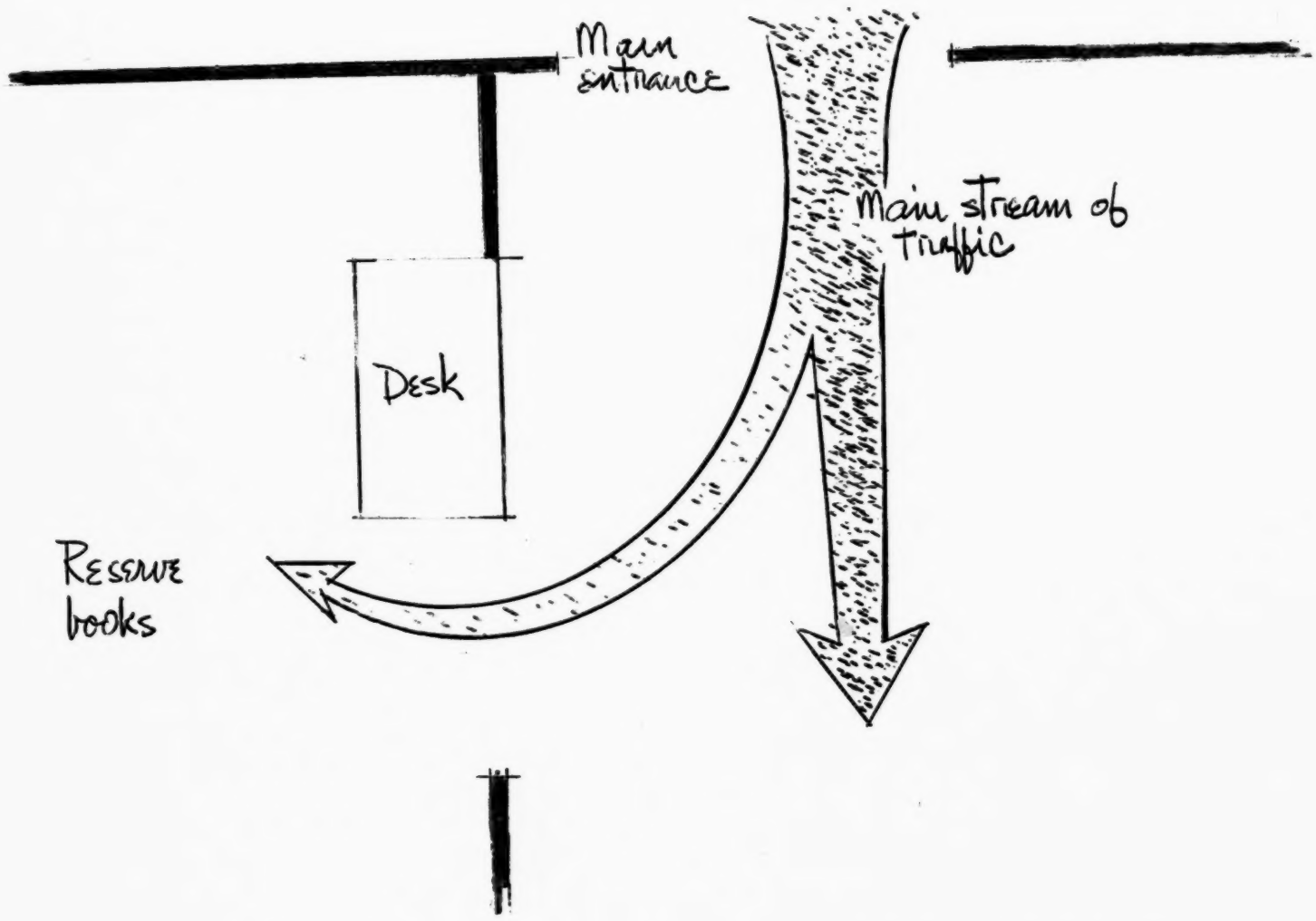
The space provided for this purpose should be varied: areas with tables and chairs, small areas interspersed throughout the book collection, study carrels, group study rooms or any other arrangement needed for effective learning. For the commuting student who merely wants a place to study while on campus, a space relatively close to the entrance and reasonably private to permit concentration should be provided. Facilities of this type can be placed anywhere on the campus and need not be limited to the library. It would be very practical to provide this space in all the buildings where classes are held so as to accommodate students who would otherwise waste time walking to the library. Frequently the scheduling of classes leaves students with time between classes that could be better utilized for study if these dispersed study areas were provided. Not only would the students who require this type of study space be benefitted, but the remaining library program would be enhanced. The elimination of the unnecessary traffic and noise would be a boon to any library.

2. Work with materials placed on reserve.

All undergraduate students and some graduate students need to use reserve materials. These materials are placed on reserve by faculty so that the time of use can be restricted. Much of the reserve material needed by students consists only of portions of an entire volume. Some of this material may be reproduced and given to each student in a class thus eliminating the need to have it placed on reserve. Attendant problems, relative to reproduction of materials, such as copyright law and cost to student should be given serious consideration. Equipment to reproduce these sections in multiple copies by print-out or some other method will probably be needed in the future and should be provided for, but would not necessarily have to be housed in the Library building.

A check-out system that can utilize some form of automation is desirable in reserve material service because the traffic is heavy immediately before and after classes. This can be implemented by use of plastic I.D. cards and imprinters, computers, or any of a variety of systems to assure efficient service. The principal concern is that immediate delivery of the material to the student is expected. The students do not browse in the collection, but request a specific title and immediately retire with it to a study space. Therefore, the only physical facilities required for the students are the study spaces and an adequate circulation desk.

The location of the reserve area is of great importance. It should be close to the main entrance and removed from the student study area because the traffic is extremely heavy and noisy. It would be most desirable to locate this as an entirely separate function. Then the reserve library could remain open longer hours and only limited personnel would be needed to supervise it.



If this area were removed from the open collection it would not be necessary to have check-out points at the exit.

3. Use of Reference Collection

Both students and faculty use the Reference Collection. It contains materials representing all divisions and is needed by all. Reference materials are of such nature that those who use them will be searching for particular items of information within a volume only. These may be encyclopedic or brief statements. Some material of this type does not circulate out of the library, and consequently special study facilities are needed.

Study areas must be near the collection and sound proof rooms for typing notes from the non-circulating materials are needed. Photo-reproduction facilities should also be available, although not necessarily located in the immediate area.

Reference areas concentrating in specific disciplines will be located in each division of the library. This follows the philosophy of keeping all the material on a given subject together when practical. The total library collection is used in reference, but a small portion of the collection -- consisting of materials referred to generally for a specific item -- will be located in each of these areas, and will not circulate. These consist of such items as encyclopedias, dictionaries, and handbooks.

Each area is (or should be) provided with a reference librarian who is a subject specialist who serves as the liaison between the book collection and the patron when needed. All the major indexes, including the card catalog or a printed catalog, need be readily available to those using the various reference rooms. Numerous other bibliographies provide reference to material in the college library and in the world at large. Computers now make it possible to print-out in book form the complete card catalog, or any portion of it in a short period of time and locate copies anywhere on the campus. But the need as expressed by enrollment and volume of work and total college budget will dictate the feasibility of applying a computer to this phase of the library program. Few statistics are available as yet in this relatively new field. Specifically, the enrollment and college budget which will dictate the use of a computer is not now known. However, on the basis of his experience at the University of California at Los Angeles, Donald Block states,

> "When an institution gets above 10,000 students, and has a book purchase budget of around $150,000 a year, and a collection of 300,000 or 400,000 titles, it has reached the point at which it warrants a small-scale computer exclusively for clerical processing." (48)

4. Use of the Periodical Collection.

The periodical collection will be used by all students and faculty. All the periodicals, bound and unbound, will be located in one area and in various formats. At the present time the bulk of the periodical collection is bound, although some materials to be purchased in the future will be in micro-form: film, micro-card, micro-print, or tape. Certain materials are no longer available in any other format while highly sophisticated and costly journals that are rarely used would conceivably be in micro-format. Browsing is not possible in any format but the printed physical volume. However, technology may eventually circumvent this major obstacle to the use of microforms. It is possible now to have the entire periodical collection in microform with machines for reading or for printing-out articles for circulation.

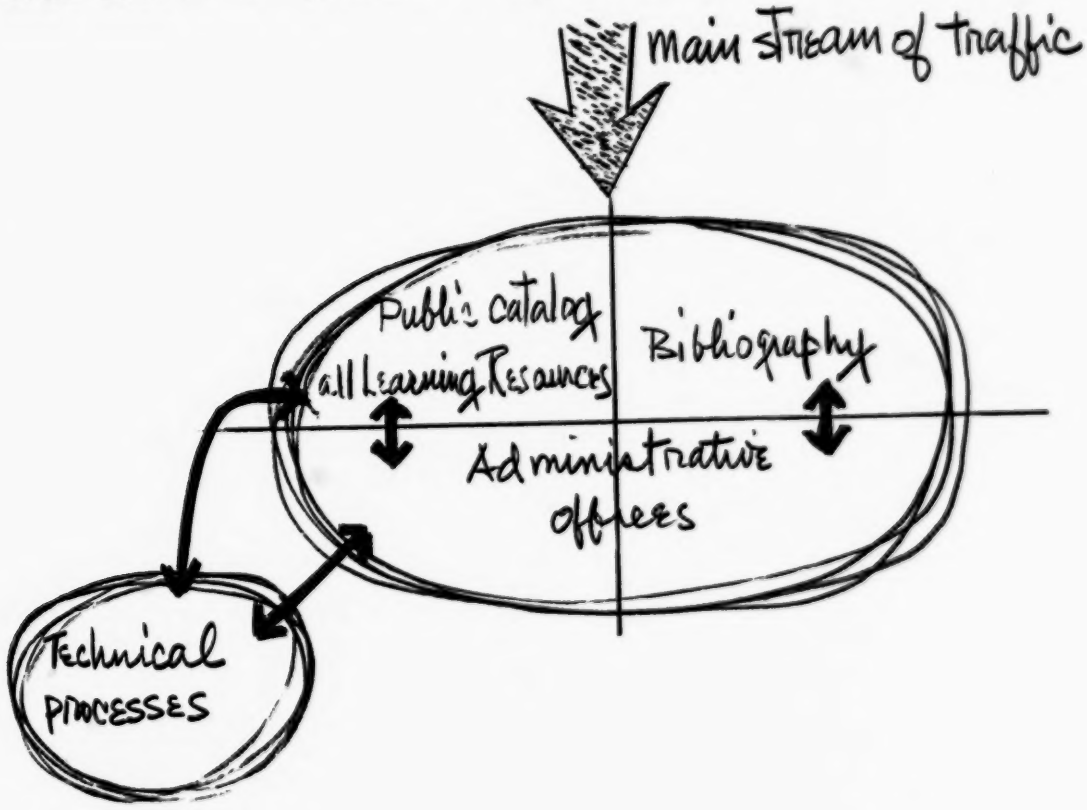
The factors to consider before committing the library to this format are: storage space, feasibility and need for browsing, cost of equipment for reading, number of users, computers or other equipment for printing-out, cost to student and faculty of print-out material, copyright laws, time factors, in reproduction and time factors in the using of machines. These factors are extremely important and should be given serious study. In a library building the problem of storage space should not be deemed more important than the use of material by students. "The basic problem of librarianship... is never storage, but always use." (7) It should also be carefully noted that up to 25% of materials used in the library is periodical literature. Studies should be made prior to using this format exclusively to ascertain the exact number of reproduction machines and space needed to accommodate the many uses. Also, determine the amount of daily maintenance costs for these same machines. At 7¢ to 10¢ per page, the cost to reproduce the periodical material for student use may become prohibitive.

Certain colleges are purchasing periodicals in microform only, although no conclusive studies are available indicating that this format is adequate. Some, however, are purchasing microforms instead of binding and are circulating the unbound issues. (18) This provides a permanent copy for the library which no one will deface and a circulating copy, all at less cost than binding.

Facilities for the periodical collection, if in bound format, should be basically the same as those for the main book collection: dispersed study tables, carrels, and group study rooms. Many periodical volumes are used at once and considerable table space is required. Frequently the study carrels are filled with periodicals being used for a long period of time. Browsing is not uncommon in the periodical collection, especially among graduate students.

Special facilities are required for reading microforms: special lighting, tables for machines, and built-in trays for typing. Indexes should be located near the circulation desk in order to be near the microform material and the periodical librarian. Assistance will often be requested by the reference librarians in the major divisional areas. The periodical room should have a public catalog listing all the periodical titles in the library, and also an index listing the complete holdings within each title.

This area will eventually be extremely large and possibly require an entire floor of a library. Logistically this should be close to the main entrance as all students and faculty representing all disciplines will use it. This concentrated traffic will be directed to a specific type of material only and should be removed from conflicting traffic. With a large projected enrollment the location of this area should not present a major problem.



The size of the building and number of staff may frequently dictate the location of the periodical collection in the library. In a small library serving 1,500 to 3,000 students with limited staff, it is necessary for the reference librarian to work with a collection covering more than one discipline (including periodicals and documents) and to have them located in one physical collection. As the student body and collection grow, and more space is available, the collection should be divided by discipline in accordance with the organization of the college or university. Reference librarians with strong concentrations in specific disciplines will then be more effective as the collection becomes larger in their own area.

5. Use of the Public Catalog

The public catalog is the key to the total library holdings and will be used by all students and faculty. It will index the following materials by author, title, subject and location:

a. Books
b. Periodicals
c. Records
d. Maps
e. Curriculum
    (1) Textbooks
    (2) Courses of Study
    (3) Juvenile Books
f. Films
g. Film strips
h. Tapes
i. Programmed materials
j. Slides
k. Prints

At the present time the main public catalog is in the form of cards contained in catalog cases. Consultation tables stand near the cases. It is possible to put the same information on tape which when fed into the computer will print-out a catalog in book form or regular catalog cards. Some institutions are doing this now and it merits consideration when operational size makes it economically feasible. The advantages of a book catalog produced by computer are many. Copies of the book catalog can be placed in various parts of the campus. Bibliographic requests can be programmed and the bibliographies printed-out on request. New acquisition lists can be printed-out and sent to faculty members as a supplement to the printed catalog. The printing-out for the public catalog can be programmed and related as a by-product to the total order procedure in technical processing.

The benefits of automating many phases of a library program are so far-reaching that serious consideration should be given to it. It will not be feasible, however, until an adequate computer is available on campus, until the book collection is large enough, the annual budget is large enough, and the enrollment is sufficient to create

the need. (48) Traditional patterns of service should not be held sacred if technology will provide better service.

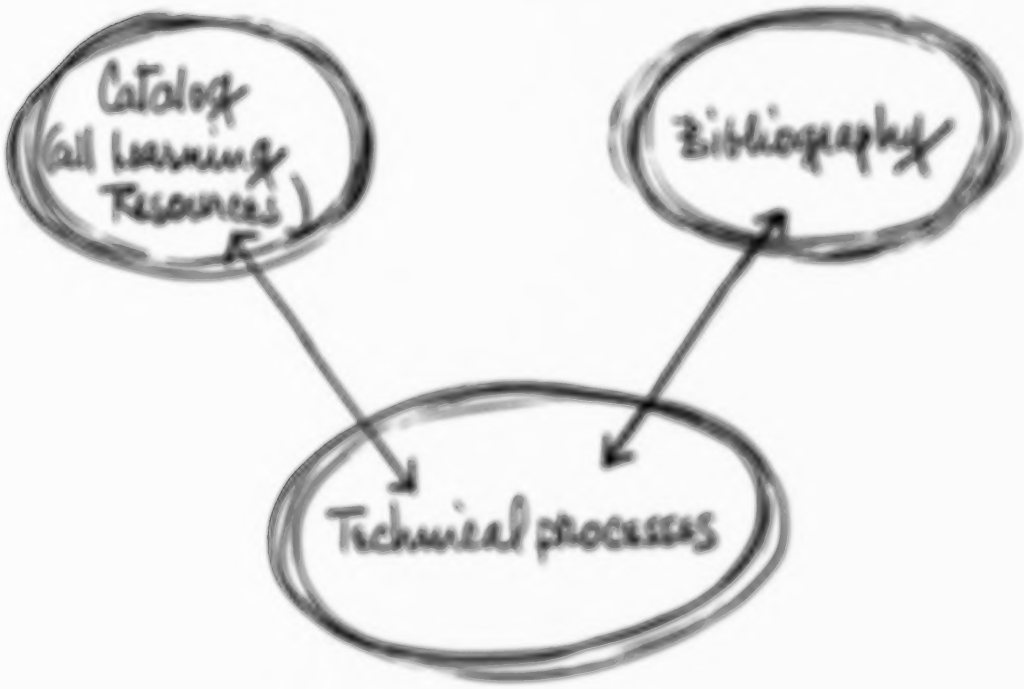
6. Use of Bibliographies

Faculty, students, and staff will use the bibliography area. It contains the major national and general subject bibliographies, such as, the Library of Congress Catalog of Printed Cards, British Museum Catalogue, Bibliotheque Nationale, National Union Catalog, American Book Prices Current, etc.

Special library furniture for these oversized volumes will be needed. At the present time the use of automated equipment is not suggested for such a facility. The possibility of printing-out bibliographies for future distribution and use should be considered by providing in the physical building for wiring channels. This possibility would relate to the multi-use of a computer in the total college program.

Printing-out bibliographies from the public catalog or reproducing printed bibliographies are both likely in the future. It is not now practical, but it may soon become so. The building would not need to be altered in anticipation of this technological advance as the computer need not be located in the library.

The bibliography area should be adjacent to the main public catalog and technical processes. It is directly related to all bibliographic work in the library.



7. Use of the Main Circulation Desk

The main circulation desk will be used by all students and faculty members for checking out or returning materials, placing holds on materials which are out in circulation, and paying fines. The proposed size of the library may require circulating desks in various areas, but the main desk will coordinate these various check-out points. All of the circulation records will be located here. An administrative office for the Head of Circulation and space for personnel to conduct the correspondence will be needed.

The only library materials located at this point will be those awaiting shelving or being held for patrons. The circulation desk will also serve to control the library materials when they are checked out to students and faculty.

Innumerable charging systems are possible. (27) These range from a simple hand-writing process to the highly automated process now used at Southern Illinois University. (30)

When the library collection exceeds 100,000 and the student body is over 5,000 FTE, some form of automation is essential in the circulation of library materials. Students should not be expected to stand at a circulation desk for extended periods of time waiting to complete the circulation process. Likewise, the book must not be on a shelf for any extended period of time after it has been returned and prior to placing it on the open shelf for student and faculty use. All existing systems such as IBM, notched cards or Addressograph, should be considered along with such a sophisticated system as that used at Southern Illinois University. Probably no other library in the country has employed automation to the extent that this new system does or proposes.

The 600,000 volumes in the university collection will be coded in "machine language" ... "translating the call number of each volume into pencil marks on specially designed code sheets. These code sheets will be recorded on magnetic tape and fed into a computer. Master cards will be produced for each volume in both "man language" and "machine language." Using the I.D. card of the student, the master book card, and the book, the transaction -- with complete information -- can be completed in twenty seconds. (30)

The library at the University of Illinois at Chicago did not use a fully automated circulation system because, "... no machine exists which will do all the things the project staff feels is necessary. Therefore, a start will probably be made with a semi-hand system using the punched cards of the final system without the fully automatic handing." (39) The varied and spectacular advances being made in circulation systems makes it unwise to change from our present simple system at the present time until there is a need. The adoption of an automated system at a later time will not entail changes requiring great expense. Physically the building will not

be affected.

Adequate space is essential for a smooth operation in this area. A large desk is necessary to check materials both in and out with speed. Both professional and clerical personnel will work behind the desk. Space for book shelves will also be needed.

The location of the main circulation desk is dependent upon the location of the book collection. Individual desk can control exits from book stacks in divisional areas and cannot be located except in relation to the book collection.

8. Use of the Book Collection

The book collection will be used by all students and faculty. The undergraduates, however, will not use it to the degree that it will be used by graduates and faculty.

The size of the book collection for the minimum requirements of an enrollment of 15,000 F.T.E. makes it necessary to departmentalize the library by subject. The number of floors in the building will also dictate the library program regarding the location of the book collection.

The types of library resources in each division will vary by subject and the policy relating to non-book materials. Books obviously will be the major resource within each division, but some non-book instructional material is needed in some subject areas. These may be phonograph records, films, tapes, prints, film strips, etc. If all types of instructional materials are to be kept together, it will be necesary to have special rooms in audiovisual services to use these materials. If not, a special area will be provided for using each of the various types of format. The latter would force the patron to go from area to area for material on a given subject. This has been recommended for the periodicals and documents collections in order to simplify handling and service. Special areas for non-book materials will be discussed in later sections.

The utilization of micro-format library material has added and serious importance beyond its anticipated function in the area of information retrieval. The deterioration of some paper used in the publication of library materials necessitates the preservation of these materials in some other format. William I. Barrow, document restorer at the Library of Congress has conducted studies proving "that books printed between 1900 and 1909 had deteriorated to less than that of newsprint and that papers of the period 1940-49 had already declined to 36 per cent of the strength they had when new." (17) A tragic example relative to paper deterioration is the 42 volume set on the Nuremberg Trials published less than twenty years ago. The paper in these volumes is now yellow and fragile. Unless reprinted on better paper or in micro-format,

this set will be lost to our academic socity.

The types of micro-format vary and include micro-card, micro-film, micro-print, microfiche and others with varying ratios of reduction and methods of reproduction. A new system using these various types are "Walnut", a government sponsored large capacity document storage and retrieval system, built by I.B.M. for the Central Intelligence Agency.

> "The latest effort in government sponsored large capacity document storage and retrieval systems is Walnut, built by International Business Machines Corporation for the Central Intelligence Agency.
>
> "Basically this retrieval system is in two parts: an adaptation of a RAMAC computer to retrieve document addresses when queried with either individual or coordinate terms which match the index terms inserted at the time the document was microfilmed and filed in the retrieval device.
>
> "All documents are indexed and microfilmed upon receipt. Standard 35mm film is used. The index terms and a unique document number are assigned, punched into paper tape, and put into the RAMAC index. An input control card with the document number and page count is loaded into the image converter where the document image is further reduced and transferred to the image strip. The file location of the document image is punched into the input control card which, in turn, is fed into the address section of the index.
>
> "The image converter puts the image on a strip of film which holds 99 page images in three rows of 33 images each. These strips are filed in image cells containing 50 strips. The image cells are stored in a bin containing 40 cells in each of five concentric circular rows. This gives a capacity of 990,000 images per image storage bin. As many bins as necessary can be used.
>
> "When information is needed, the requestor states his needs in terms of the index entries. These terms are punched into paper tape and matching entries are printed out and address cards are punched. The user selects the entries he wishes to have reproduced and these address cards are fed into the retrieval mechanism of the storage bin. The address card has an aperture containing a piece of undeveloped film large enough to receive four document images. As the address card is read, the bin is rotated to the correct cell row and shifted to the right circle. The film is removed by a pincer like device which has selected the correct strip

of the 50 in the cell and raised it to the correct image height. The optical system is indexed to the right image row on the strip and an exposure is made. As soon as the address card is read it is moved into position to receive the image from the strip in the cell. A mercury vapor lamp makes the exposure and the film in the aperture card is fixed by heat. It is then stacked for the user who can read it on an optical reader or put it in a printer for hard copy." (39)

The AVCO Corporation is working on a system called VERAC.

"This machine differs from the others outlined above in that the photo reduction is as high as 240:1.

"Again, no system has been advocated for information retrieval. The user will have to have his own system.

"The Verac machine records a page of text on a sheet of film which would have the images placed serially in discrete locations. Several film sheets would be stacked together in the retrieval device. The capacity of each "block" of film would be 1,000,000 images. This would mean 100 rows of 100 images per sheet of film and 100 sheets to the "block." "(39)

Facilities for using book materials will be in the form of study stations. These should be dispersed in the stacks in small groups of tables and individual study carrels. Tables adjacent to the divisional reference collection will also be necessary. Each of the divisional areas should have a typing room to accommodate students who wish to take notes from non-circulating materials by typewriting. Many students type term papers from the resources in the library. Typing rooms should be away from the immediate study area because of the noise.

A photo-copy machine should be available for students and faculty. This function can possibly be considered as part of the book store operation and serve all student needs on the campus. For library usage in making Library of Congress Cards and duplicating necessary materials, Xerox is presently the most recommended process.

Each subject division will have its own public catalog. This catalog will be limited to the material in the particular subject area. It should be located close to the reference desk in order that librarians may use it to assist students and faculty in using the collection.

The circulation desk in this area should be automated to the extent that the main circulation desk is automated. Space will be allocated in each division on the basis of projected growth of the collection and the student body.

9. Use of Study Carrels

Study carrels will be used in a variety of ways. Most should be unassigned and used on a daily basis for private study. Graduate students and faculty will be assigned carrels to a greater extent than will undergraduates. The design of the carrels will depend upon use. These can be simply an enclosed area with a fixed desk and chair or an elaborate carrel as exists at Cornell. The latter consists of a room large enough to hold a nine foot desk with file cabinets, shelves, a desk chair, and a large reading chair and lamp. The use may vary from individual self-study, listening to phonograph records, watching television, to working with electronic automated equipment, both to send and receive messages to central areas dispersing sound and pictures (15)(13) The sophistication of the study carrels in the library will depend to a great extent upon the organization of the college or university. If an effective independent study center exists in the institution, the electronic study carrels will be part of this complex. The study carrels in the library will then be modified for utilization of only library materials. The study carrels will be located throughout the library for use of library materials in close proximity to the location of the materials.

10. Use of Small Group Study Rooms

Students, and in some instances, faculty members working with students will use the group study rooms. These rooms are to accommodate small groups of students whose assignments necessitate discussion and study. Spontaneous discussions by groups in the general study area in the library will be directed to the group study rooms. Students will work with materials brought by them to the library and will utilize resources in the library. These rooms should be sound proof and equipped with chalk boards and racks to hang maps. Group study rooms should be provided in each divisional area with entrances directly from the book collection. One side of the group study room should be enclosed in glass. Each group study room should be equipped to receive closed circuit television.

11. Use of Seminar Rooms

Seminar rooms will be used by students and faculty. Utilization of these rooms will be by groups working directly with materials housed in the library. These should not be assigned as classrooms unless the class is directly related to library methods or a course in bibliography. Seminar rooms should be equipped with book shelves, chalk boards, racks to hang maps, and a screen. Each seminar room should be electronically equipped to receive all forms of instructional materials. Seminar rooms should be located in each divisional area within the library complex.

12. Use of Faculty Offices

Faculty offices in the Divisions of Humanities and Social and Behavioral Sciences may be advantageously located in the library

complex. The rationale for this is that these divisions are more closely oriented to the library collection than other divisions and the faculty will be working directly with students in the book collection.

Proximity of faculty offices to the book collection within the library should be related to the particular relevant materials. The offices should be removed from the library operation with separate entrances from them to the library itself and traffic should be such that students can go directly to the faculty offices without the necessity of walking through the library.

13. Use by Visually Handicapped Students

This area will be used by visually handicapped students and their readers. Soundproof rooms and wiring for special equipment is necessary to accommodate students listening to discs prepared by readers. Little traffic will be anticipated in this area and for obvious reasons its location should be close to the main entrance.

14. Use of the Curriculum Library (in) colleges providing Teacher Education Curricula. (22)

a. In colleges with this type of curricula, the Curriculum Library will be used principally by students and faculty directly related to the Education Division, although many of its resources will be useful to all students and faculty on the campus. Resources housed in this area can be such items as courses of study, teaching aids (physical learning devices), records, pictures, pamphlets, textbooks, a juvenile book collection, college catalogs and newletters. Because of the distinct overlapping of function between materials in this area and those housed in an Audiovisual Service Center, the following assumptions can be made:

(1) That certain of the traditional distinctions in the function of the Library and the A-V Services are becoming blurred and will become more so.

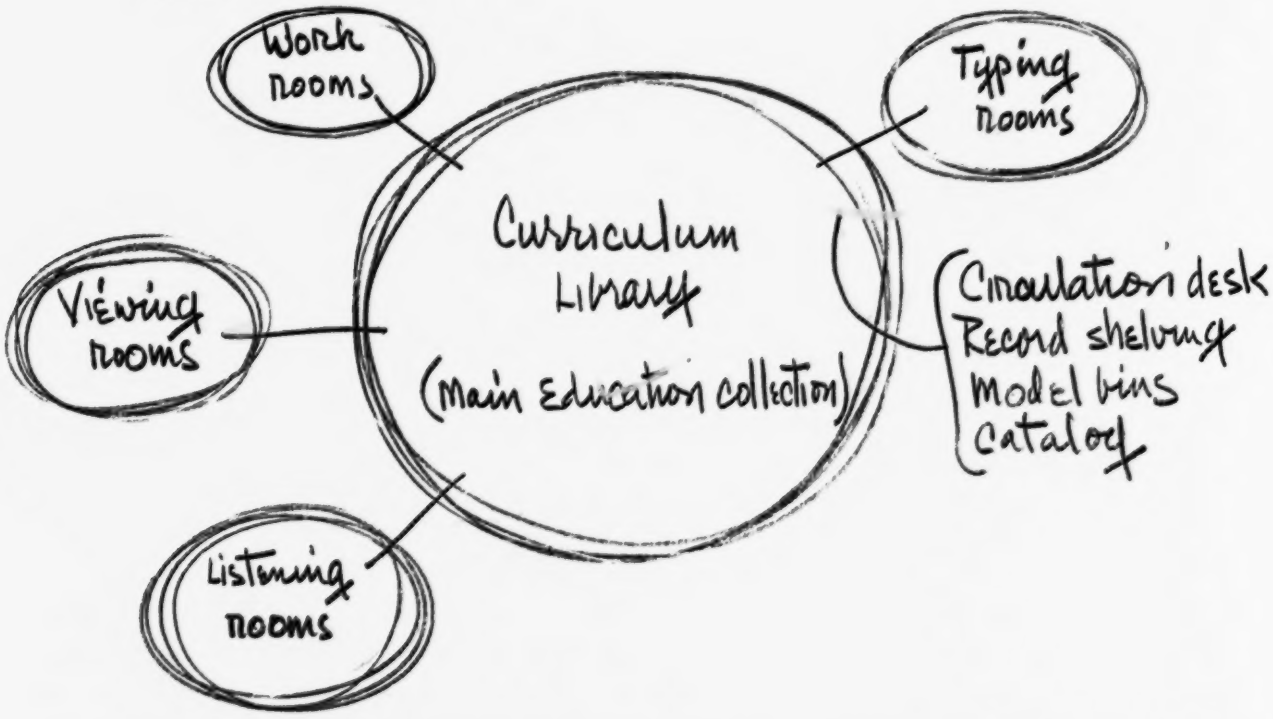
(2) That the areas of blurring distinction are related to the service provided staff and students in regard to:

(a) Access to information about holdings (cataloging);
(b) Access to the material itself (distribution);
(c) The fact that content on a given subject is being "packaged" using more than one communication device.

(3) That technical administration of the Library and A-V programs together with specific functions (such as instructional materials preparation), are distinct areas requiring specialized staff, skills, and training.

(4) That there is an increasing use of non-book material to which students are referred for individual study. Outside viewing and listening is taking its place along with outside reading. This will be increasingly true as various teaching machines and electronic distribution via computer of content expand.

(5) That the Curriculum Materials Laboratory, serving primarily the institutional program in the education of teachers, will be housed in the learning resources complex. To be effective this center must be able to handle an extensive range of curriculum materials.



(6) That the immediate needs of most libraries for electronic and mechanical storage and retrieval of information are usually limited at present to micro-format materials. The building should, nevertheless, be so planned that both services are part of a central campus distribution system. This central distribution system will undoubtedly be almost immediately involved in closed circuit T.V., the Programmed Learning Center, or Independent Study Center, and shortly in campus distribution of visual media.

(7) That there is a necessity for a joint catalog representing all materials in both the Library and the Audiovisual Services area.

b. Physical Housing of the Collection of Instructional Materials

The needs of the students and staff are best served when careful thought has been given to the most appropriate space for deposit of material commensurate with administrative and economic necessities.

Instructional materials should be housed in three spaces:

(1) Departmental collections for materials used only by given departmental staff within the department's administrative and classroom space.

(2) Special subject matter collections associated physically with related books (under the LC classification system).

(3) The curriculum materials center with courses of study, teaching units, research units, and texts; and possibly slides, strips, and recordings.

Three major areas in the library (see #2 above) would be equipped with viewing, listening, and storage facilities for this type of closely related material:

(1) The graphic arts collection of books and prints; and possibly recordings, selected films.

(2) The music collection with books, manuscripts, and scores; and possibly recordings, selected films, slides and filmstrips.

(3) Social and Behavioral Science, Humanities, and Science collections with appropriate map and microformat facilities. (23)

The problem of administration, circulation, and repair of the holdings of the Curriculum Materials Center is such that it should be located commonly between the Curriculum Materials Center and the Audiovisual Services Center. If student and staff access to the material funnels through the library channels, administration of the collection should be a shared function worked out in relation to specific materials. Check-out and use of certain types of materials such as films, slides, recordings and filmstrips may be from the Audiovisual Services Center.

c. Study Spaces

(1) The Curriculum Materials area should be constructed so that appropriate study spaces are provided:

(a) Listening and viewing spaces associated with the areas housing non-book materials. Desirably these libraries will be in the various schools of the university or divisional areas of a combined college library.

(b) Micro-film and micro-card reading rooms.

(c) The viewing and listening spaces associated with a curriculum materials center should be available for individual and group use, campus wide.

(d) The work rooms equipped with chalk boards, bulletin boards, sinks, and large work tables.

(e) A special room should be provided in this area as a demonstration classroom with flexibility to allow a variety of types of seating arrangements, setting up displays, as well as conducting demonstrations relative to education courses.

(2) All equipment maintenance and repair in the listening and viewing areas throughout the library should be under the charge of the A-V Services Center.

(3) The quality of the equipment would be appropriate to the function. For example, the listening equipment in the music collection might be different from the listening equipment in the curriculum materials area.

d. Specific Problems and Issues

Several issues are raised by the integration of selected library and A-V functions discussed above.

(1) Because of the varying patterns of budgeting it is recommended that funds for the acquisition of materials and equipment be maintained in three budgets.

(a) The departmental budget. Materials may be acquired under departments which will be subsequently deposited for longer or shorter periods within the Library or Audiovisual Services Center.

(b) Materials may be acquired under the A-V budget and deposited in the Library.

(c) Materials may be purchased under the Library budget, and deposited in the Audiovisual Services.

This sharing of responsibility for the acquisition of instructional materials requires a formal statement of purpose and a continuing discussion of specific materials to avoid unnecessary duplication. However, it implies that some duplication is probably necessary to best serve the needs of student and staff.

e. Photographic and other duplication services.

The library would have access to the photographic and other duplication facilities of the A-V materials preparation section. However, simple reproduction, such as, reflex copy equipment or Xerox may be located in several spaces in the Library.

f. Responsibility for planning, selection, and balance of the several collections and space needs is not the exclusive province of either the Library or the A-V Services. There is a shared campus-wide responsibility inherent in the proposed allocation system. Suggestions for modification and acquisition would be channeled through the appropriate head of either service.

15. Use of Micro-Format Materials

All students and faculty will use materials represented in this format. Some library materials, such as, newspapers, periodicals, books, scores, maps, etc., are available only on micro-film, or micro-cards. Following the policy that most material on a particular subject should be located in one area, rooms should be provided in both the Creative Arts and Humanities Divisions of a Library to implement the utilization of these micro-format materials. Machines will be necessary to project and reproduce these materials and rooms equipped with counters and special lighting for reading purposes will be needed. It should be anticipated that some of the materials currently available in this format will eventually be available to the college from off-campus by means of electronics and wiring. Spaces anticipating this should be provided. These rooms should be located in close proximity to a public service point as assistance by librarians will be occasionally needed and the material will have to be controlled when in use. It is feasible that the occasional materials represented in this format and relative to other divisions be utilized in these two areas.

16. Use of Art Slides

These materials will be used primarily by students in the Creative Arts Division. If they are also used by other fields of knowledge, the facility should be located in the Creative Arts Division of the Library rather than the Art Department. A reference librarian with a specialty in Creative Arts, can frequently use this material as a reference source for students outside the Creative Arts area. A small viewing room equipped with special lighting should be located in close proximity to the Reference Librarian. The anticipated use is not considerable and traffic should not create a major problem. A special slide catalog for physical storage and small work area for physical slide preparation and cataloging is necessary.

17. Use of Art Prints

This area will house art reproductions to be used by students and faculty generally as implementation to art courses and other courses in area cultures. A large room equipped with special cabinets and lighting for purposes of storage and viewing will be necessary. A Creative Arts Reference Librarian should work closely with the students and faculty in this area, and consequently, the location of

this room should be in close proximity to the reference collection and public service area. A work room for mounting prints and cataloging will be necessary.

18. Use of Map Room (45)

Students and faculty using these materials will be predominantly in the areas of Humanities, Social and Behavioral Science, and Science. Considerable space is necessary for this program and special cabinets and tables will have to be provided. The type of material used in this area will necessitate large work spaces, tracing machines, and a large circulation desk. Because of the noise factor, bulk, and oversized materials attendant to this phase of the library program, it should be removed from the general study area. This program can be located in any part of the Library-Audiovisual building because of the overlapping relationship to the various disciplines. A large work area should be provided to process these materials. Large work tables will be essential. A special card catalog listing these materials should also be located in this area.

19. Use of Phono-Discs

Students in most of the disciplines will use records or tapes relative to their programs at the college or for educational purposes. Various types of materials available in this medium are plays, speeches, poetry, classical music, and recreational music. A variety of facilities can be used ranging from individual listening booths or study carrels to large group listening booths using individual machines or having the audio materials electronically sent in from a central source located in the building. (6) These materials will be cataloged in the technical processing area of the library, listed in the main card catalog, and a special catalog located in the area. Facilities for their use can be provided in various locations in the library or in the audiovisual service center.

20. Use of Documents

Documents will be used by all students and faculty on the campus, and will be housed in an area removed from the rest of the collection. The accumulation of documentary materials becomes enormous and this phase of the library program is often a large special library within the library. Since the cataloging system is often distinct and unlike the Dewey or Library of Congress systems, a separate catalog is provided for the material in this area. Special shelving is necessary and considerable space is needed. This program can be located anywhere within the library program, but will function as a separate unit. Some of the document material received will be in micro-format. Some form of electronic processing should be anticipated in this area and channels for electronic conduits should be provided.

21. Use of Newspapers

Both students and faculty avail themselves of the many newspapers to which the colleges subscribe. They relate to both courses and general

interest reading. Special racks for the newspapers as well as large reading chairs, lamps, and study tables should be provided. This area should be reasonably close to the front entrance. The back issues of newspapers should be available in the library on micro-format and not housed in this area.

22. Use of Faculty Reading Room

If private study cubicles are not provided for faculty, a general faculty reading room should be located away from student traffic. Individual study tables, large reading chairs, and shelves for special materials should be provided.

23. Use of Typing Rooms

These should be available for use by all students and faculty and should be located in each major area of the library. These rooms should be equipped with counters to house the rental typewriters, as well as those provided by the students. All the typing rooms should be sound proof and preferably located adjacent to the stacks and removed from the study areas.

24. Use of Rare Books and Archives

Rare books and archival materials received by the library have to be controlled differently than the rest of the collection. These materials may be very expensive, fragile, in rare bindings, and impossible to replace. To protect both the student and the materials these should be housed in a separate area and available only upon request. Materials of this sort generally require special cataloging and physical processing. A small work table and study table will be needed for students and faculty working with these materials in this area. The college archives can also be located in this area.

Normally these materials do not circulate and are used in the area only.

25. Use of Administrative Offices

The Administrative Offices should be reasonably close to the main entrance for use by both faculty and students. It is expected that this area should provide for the College Librarian, his Secretary, Chief Assistant Librarians, a small conference room and a work room. All other administrative personnel within the library program would be located within the physical area of their responsibility.

26. Use of Technical Processing Area

The library staff and an occasional faculty member will use this area. All materials purchased by the library should be initiated here and their processing done here. Space is a prime factor as considerable material will pass through this area. Experience has shown that this

area is frequently underestimated and in a large library will require separate large rooms for the various functions listed below. Regardless of the method of processing the mass of physical material dictates the need for space. Anticipation of utilization of a computer for part of this operation will not change the physical design of the building. It will save some personnel for use elsewhere.

It is impossible to substantiate the exact figures relating to implementation of a computer program at the college or university. As stated earlier, Donald Block recommends computerized operations when the college reaches 10,000 students, has a book purchase budget of $150,000 per year and a collection of between 300,000 and 400,000 titles.

Robert Hayes, Project Consultant, writes in his comments after visiting the college,

> "However, having pointed out that information retrieval is neither economic nor technically feasible for the college library, I must now say that it is the responsibility, I feel, of the college library to make a very substantial effort to install a mechanized information retrieval system despite the fact that it is neither economic nor technically feasible. I say this because I feel the college and university should be a leader in a technical revolution rather than a blind follower of it. The revolution being wrought by the computer is having effects not only on our understanding of information processing but on the very structure of our society. It is, therefore, exceedingly important that the college and university truly educate the coming generations in the character of this revolution and the methods for controlling it. This can only be accomplished by providing an environment in which the student learns to work with the computer on the deepest technical problems in its application. Information retrieval represents an ideal vehicle for such education." (24)

The utilization of a computer for the requisition of materials is a single adaption of good business practices. Inventory control by computer is now an acceptable practice and should be used if the computer can be purchased. Time and cost studies should be made in each institution to ascertain the feasibility of the anticipated program. Both the processing of serials and the operating of the circulation function should be considered in the installation of the computer program. As stated elsewhere in this monograph, until major experimental projects have been completed one should be cautious before completely committing a library to this expensive program.

The areas within this phase of the library program are as follows:

a. Orders
b. Bibliography
c. Receiving - mailing
d. Cataloging
e. Typing, filing, etc.
f. Book repair
g. Preparing for binding
h. Office space

For a college of 1,500 or 2,000 students, and perhaps of 5,000, a large open area will be adequate for this operation with the exception of receiving and administrative office. The office should be within the area and, private. Receiving should be adjacent to a loading platform and removed from the rest of the technical processing by a solid wall. The acquisition and cataloging departments in technical processing should be located adjacent to the bibliography area, and as close as possible to the public catalog area.

Special equipment in the form of counters and work tables will be needed in receiving and book repair areas. Shelving throughout the rest of the area will be essential.

If cooperative acquisitions and processing can be anticipated, costs could be reduced and space needed in the library for ordering and cataloging of material would be less.

"Any study of cooperative acquisitions must deal with two facets of the problem: one is cooperation to avoid unnecessary duplication of materials in order that regional resources may

be increased; the other is cooperation to acquire, process and store the materials as cheaply as possible, consistent with reasonable speed of acquisition and availability."(18)

Institutional subject specialization by library acquisition is well illustrated by the Farmington Plan (12). The plan was conceived in 1942 by a statement by Julian Boyd calling for completion of the National Union Catalog and agreement of specialization among libraries assuring that at least one copy of each research title published abroad be located in one of the participating libraries. Many problems such as changed budgets, student needs, changed programs and changing faculty have made the program less than a complete success.

Regardless of the degree of success of a program in the library based on the Farmington Plan concept, the space needs would remain the same as the participating library would be expending its funds in special fields rather than in many fields.

The possibility of central storage in a large warehouse for lesser used materials for a group of libraries will more directly relate to space needs. A basic collection of 100,000 volumes would be needed at each campus and less frequently used materials would be placed in storage. The storage concept presents various problems to the students and faculty members in the form of browsing and inability to use the book when needed. Storage consideration is important, but excellence in education paramount.

VI. THE TYPE OF BUILDING CONSTRUCTION

A cardinal principle to be considered at all times in the design of physical facilities must be provided to accommodate this objective.

The inability to accurately project the various types of programs a college or university will eventually have and the difficulty in determining the most effective methods for their implementation underscore the need for a physical building with great internal flexibility for future modifications and possibilities for additions or supplementation. Large open areas with few permanent walls should be the basic standard. Modular construction is a generally accepted building principle in today's libraries and has been stressed by all of the consultants to the DEPLAN Project. Dr. Seymour D. Metcalf, former Director of Harvard University Library and prominent building consultant, expresses a need for caution in the acceptance of this principle:

"A second group of problems involves what we call the modular system of construction. Briefly, this means that the interior of the building is supported by columns instead of bearing walls.

and is made up of a number of modules identical in dimensions. Arguments for this sytem are that the total cost per square foot or cubic foot is reduced because of simplified and thereby cheaper construction, and more important, that complete flexibility is obtained, because all modules are alike and can be used for any purpose, now or later. Objections are more complicated, but are based on three facts:

1. That no module is perfect in size for all types of use.

2. That the system tends to produce a not quite first-class building because no part of it, being all a compromise, is perfect for any type of use.

3. That the architect and the librarian, in planning a modular building, tend to fall back on the fact that the building is flexible, and consequently do not plan ahead in sufficient detail. Actually the system requires more rather than less thorough planning for the most satisfactory results.

The disadvantages of the modular system have been stressed, because, in this writer's opinion, its advantages have been overemphasized." (34)

Channels for electrical wiring anticipating various forms of automation in the library program should be installed throughout the building as well as in all buildings on the campus. Audiovisual communications within and between buildings to promote better instruction is today a reality. To build any instructional complex today and not anticipate this accepted educational method of instruction is to close one's eyes to the obvious.(28) Instructional [illegible] to those described by Hyman Chausow of Chicago City Green of Rensselaer Polytechnic Institute [illegible] advantages of following this educational pattern. Based [illegible] recommendations of the consultants to the DEPLAA Project, [illegible] be remiss in our responsibility not to plan accordingly.

For the utilization of micro-format materials, humidity [illegible] areas housing these materials is essential.

Directly related to the modular type of construction is th[illegible] ity of eliminating a central core of fixed services in the [illegible] and their placement on the perimeter of the building. Th[illegible] services includes the stairwells, elevators, rest rooms and [illegible] shafts. A fixed central area of this sort will dictate th[illegible] program within the building and remove much of the flexibi[illegible] essary in the adoption of various physical arrangements a[illegible] tion of new methods. It will also create unnecessary tra[illegible] patterns and resulting noise factors, both of which are i[illegible] and should be guarded against. Placing the stairwells an[illegible] shafts adjacent to the building entrances will eliminate [illegible]

traffic problems and attendant noise and will accommodate students and faculty in more efficient use of the building.

Split level floors should be avoided as books are constantly being moved on trucks and physically handicapped students and faculty must be accommodated. The tendency to concentrate too many activities within one building should be given serious attention. The location of such a building on the edge of the campus will compel all students and faculty to funnel toward it. The more multi-purpose the building becomes the greater the traffic and attendant problems that become academic hazards. (11)(35) The various activities within the building, such as Library-Audiovisual Service, the Programmed Learning or Independent Study Center, and Faculty Offices should have entrances planned to avoid the unwieldy traffic that would be inevitable in campuses over 5,000.

Approximately 50% of the students who use the library do so for study purposes only. Materials studied are brought with them and are not materials necessarily found in the library. This study space could be provided in any or all buildings on the campus, including residence halls, saving the students considerable time and effort and also eliminating considerable traffic on the campus.

If adequate control and funds are provided, minimum collections, including standard reference material, may be placed in each residence hall. Dr. Samuel Baskin of Antioch College stated that small library collections are located in the dormitories at Antioch with considerable success. It should be understood that duplication of materials will be necessary to implement this program.

The library of any large college or university -- being some distance from certain parts of the campus -- could force students to walk long distances to study for short periods or [illegible] supervised study space in all buildings will eliminate this wasted time.

Too, a major study area within the library should be provided for students on a 24-hour basis. This area will have to be removed from the rest of the library program, but within the library complex, if circulation service and control will not be provided on this extended basis.

Future physical expansion must be anticipated (11) in any present-day college or university. Experience has shown that libraries in the California State Colleges built since World War II, have of necessity been added to in recent years. Growth -- both by the purchase of new publications and the need for old titles, and an anticipated large student enrollment -- makes obvious the need to anticipate expansion. National statistics and various state surveys substantiate the actual needs as for new library construction. Flexibility in the future use of these buildings will make them more adaptable to future needs and to new library developments which can be dimly seen at the present writing. (14)(34)(31)(25)(36)

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Chapter VI

THE ROLES OF DIGITAL COMPUTERS IN A LEARNING RESOURCES CENTER

One day in September, 1951, the Pacific Palisades, California, Post reported that a new local resident was employed by the National Bureau of Standards Institute for New Miracle (sic) Analysis. Approximately one year earlier, A. M. Turing (55) had said: "I believe that in about fifty years' time it will be possible to programme computers, with a storage capacity of about 10^9, to make them play the imitation game so well that an average interrogator will not have more than 70 per cent chance of making the right identification after five minutes of questioning. The original question, 'can machines think', I believe to be too meaningless to deserve discussion. Nevertheless, I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted. I believe further that no useful purpose is served by concealing these beliefs."

At approximately the other end of the spectrum from the above thesis stands Mortimer Taube (53). Further, Scott Crossfield was quoted (by A. M. Zarem in his luncheon speech at the Fall Joint Computer Conference, Las Vegas, Nevada, November 14, 1963) as objecting to the proposed use of a robot pilot for the X-15 in the following term: "Where else can you get a 170-lb. non-linear computer with a 1 billion bit memory, with the added feature that the gadget can be mass-produced by unskilled labor?"

Whether one agrees with Taube or Turing is not really relevant. What is important is that every authority agrees that: (1) computers are here to stay, and (2) computers will continue to increase their influence on the lives of all.

It seems reasonable to assume that computers will play important and ever-increasing roles in college or university Learning Resources Centers. These roles will be for the most part, entirely above and beyond "standard", "scientific" and "business" uses of computers in various disciplines. The latter are too well known to warrant attention here except as they impinge on the newer roles of computers in connection with the discussion of college and university learning resource centers.

ROLES OF COMPUTERS IN INSTRUCTION

Computer-Based Autoinstruction

Many individuals and organizations have been concerned with the study and development of computer-based autoinstruction. Among them are O. K. Moore of Yale and Rutgers (41), Coulson and his co-workers at System Development Corporation(8), (9), (10), (13), Uttal and his colleagues at IBM's T. J. Watson Research Center (17), (27), (58), (59), (60), Silvern of Hughes Aircraft Company and Education and Training Consultants (51),

Braunfeld et al at the University of Illinois (6), and Feuerzeig of Bolt, Beranek and Newman (21). Successes of these initial endeavors support the belief that the future of such activities is bright, indeed, provided that sufficient money and talent continues to be available.

One of the most exciting of these experiments is that of Feurzeig who programmed "Medical Case I" for the PDP-I Computer. It concerns the teaching of a prospective M.D. to diagnose the presence of pneumococcal pneumonia in a "patient" whose symptoms and laboratory results he has available. Dr. E. Z. Rothkopf, a psychologist with Bell Telephone Laboratories, Murray Hill, New Jersey, agrees that Feurzeig's approach is a good one, since the "substitute teacher" must be as nearly like a real teacher as possible (in the sense of giving the student a feeling that he is actually being talked to by a human being). Dr. Rohtkopf and his colleague, Dr. R. W. Hamming (a mathematician), however believe that"substitute" teachers will never do as well in instruction as good teachers. But they do feel that automated instructional approaches are important cause the supply of good teachers is insufficient.

Simulation

The term "simulation" is difficult to define so as to distinguish it from the term, "computer-based autoinstruction", used earlier. But there ar a number of efforts at simulation that do not appear, at least intuitively, to belong in the autoinstructional category. A good example of this is the "Sumerian Economic Game", as programmed for the IBM 7090 by IBM's Advanced Systems Development Division at Peekskill, N.Y. In this "game", the player is "appointed" King of Lagash, a City-State of sumer in 3500 B.C. As King, it is his duty to decide the disposition of his resources (symbolized by grain). Each six months there is a "harvest", when the "King" must make another set of decisions. At the end of each harvest period he is apprised of the effects of his decisions upon his people. Several kinds of choices and magnitudes of "disasters" are part of the game.

The Board of Cooperative Educational Services (BOCES), First Supervisory District, Westchester County, N.Y., has done some similar things under the direction of Dr. R. L. King, Coordinator of Curriculum Research (5). Dr. Jack Edling, of the Oregon Higher Education System, and his staff have also simulated the educational program of a 1200 student college. This has been done with the use of a slightly modified version of SIMPAC, which is a "simulation package" concocted by System Development Corporation of Santa Monica, California.

There are, of course, many other examples of computer-simulated situations, such as simulation of supply systems, automobile traffic, demographic dynamics as well as operational gaming (Morse, in (23)). These kinds of activities appear to provide promising possibilities of use in a Learning Resources Center.

Information Storage and Retrieval

Claims and counter claims have been made regarding the current and

and probable future success of Automatic Information Storage and Retreival programs. Nearly everyone would agree that storage and retrieval of documents can be (and is being) successfully performed with the aid of digital computers. Furthermore, the National Library of Medicine (in late 1963) turned over the job of preparing its Index Medicus, a monthly bibliography of current medical journal literature, to a digital computer-based system. It should be emphasized, however, that MEDLARS (Medical Literature Analysis and Retrieval System) (38) requires that human beings index or catalog each document received by the Library, and to prepare for it a "unit record" consisting of a citation and associated headings. Furthermore, demand requests (for bibliographic information) received by the Library will be sorted and distributed to a staff of bibliographic specialists called searchers. It will be their task to translate requests into the language, syntax, and format required by the system. In the same manner that indexers select subject heading adequately classifying entries, these bibliographic searchers will select headings to identify entries for retrieval. Finally, the "information" (bibliographic citations) retrieved by the computer will be screened by searchers to insure that it satisfies the original requests before being transmitted to the original requester. Thus one sees that the MEDLARS system is greatly dependent on humans; it uses "mechanization" only for those funtions best fitted for this purpose, (eg; repetitive and time-consuming activities capable of being performed by computers faster and more reliably than by human beings).

G. W. King and six colleagues (34) recommend that the Library of Congress request $750,000 from Congress to be used to prepare detailed system specifications for the automation of many aspects of the library's operations and to provide new services now considered impractical or impossible using today's manual methods. Among such new services would be a communications network linking the nation's major research libraries for use in distributing bibliographic information. Recommendations of the report envisage a system having a storage capacity of 10^{11} or 10^{12} bits, with several display consoles buffered by 2×10^{9} bit random access memories. When (and if) such a system becomes available, college and university Learning Resources Centers all over the country will want to have access to it.

Another closely related proposal is that currently under study by the House Education and Labor Subcommittee, headed by Rep. R. C. Puscinski (Illinois) a bill (H.R.1964) to establish a "National Research Data Processing and Information Retrieval Center." In June, 1964 Congressman Puscinski envisaged such a scientific "nerve center" as being linked to university libraries and industrial laboratories to permit national, (perhaps, later, international) exchange of scientific data. Even if the cost of this program were to run to as much as $300 million annually, says the Congressman, the price would be small when one considers the possibilities of eliminating duplications of research currently being financed ($17 billion annually) in the United States.

Dr. Jerome Wiesner, former Presidential Science Advisor (now Dean of Science at M.I.T.), advises a "go-slow" approach in this and other efforts at information retrieval".

Indeed, as the keynote speaker at the Spring Joint Computer Conference (April, 1964, Washington, D.C.), Dr. Wiesner said that there are probably more unfulfilled promises being made about information retrieval than for any other area. Needed, according to Dr. Wiesner, are: (a) studies in the learning processes and machine translation, (b) good, hard work in the mathematics and logic of computers, (c) greater public understanding and acceptance of computers, and (d) higher class of machines, with larger fast memories, greater internal speeds, parallel operation and the ability to handle bulky languages.

In a private conversation with the author, Dr. R. W. Hamming (Bell Telephone Laboratory, Murray Hill, N.J.) indicated his feeling that true automatic information retrieval, in the general sense, is not possible because: (1) too many changes occur in subject matter, which spoils things, and (2) indexing problems are too great. In some very restricted subject fields, however, Dr. Hamming is willing to admit that success may be possible.

Professor, J. G. Kemeny (Chairman, Mathematics Department, Dartmouth College) has examined "A Library for 2000 A.D." (22), described as being good until 2100 A.D. He concludes that what is needed is a single central library to serve research workers in the federal government and the major universities of the country. He would not outlaw the pleasures of browsing (through a "small" collection of "hard-bound" volumes on any given campus). Indeed, he would make a strong case for keeping on such campuses [illegible] consulted as often as once a week. He conjectures that it will take approximately 20 years for our universities to decide that their libraries are becoming obsolete (in terms of really serving the potential user). He, therefore, proposes that each of 100 major universities agree to contribute $100,000 per year from 1960 A.D. to 2000 A.D. (with such funds to be matched by the U.S. Government). He visualizes that this order of magnitude of funds and time would be necessary to design and build a "National Research Library." Dr. Kemeny concludes that even with all the elaborate mechanization in such an effort, information retrieval may become a hopeless problem in as little as 100 years.

Dr. R. M. Hayes, formerly President of the American Documentation Institute, and consultant to the DEPLOR project, has spelled out his feeling that a college has a responsibility to lead in such technical revolutions as information retrieval, although at present it is neither economically or technically feasible for college libraries. This says Dr. Hayes, is because revolution now being wrought by the computer affects the very structure of society.

III. Recent and Future Hardware and Software Developments

A. Remote Access to Computers

A number of efforts are being made currently to design and use "remoteconsole, on-line, time-shared: computing systems. Notable among these is Project MAC (22), May 1964, headquartered at M. I. T. and directed by Dr. Robert Fano, Professor of Electrical Engineering. Backed by funds from the Advanced Research Projects Agency (ARPA) of the Department of Defense, MAC is investigating a whole spectrum of ideas aimed, hopefully, at using computers so as truly to amplify human intelligence. As indicated, one of the chief interests of the project is to design an economically feasible system for almost simultaneous access to a central computer from several remotely-located "consoles." A total of 24 such remote stations are now connected to a central computer; 26 more will soon be available. With the proper kind of "supervisory" program in the computer, it is possible so to synchronize the computer's fast operational capabilities so each remote user experiences no appreciable delay in getting access to "his" machine to solve a "small" problem or input new data for one of his "large" problems. Freshmen in civil engineering at M.I.T. recently solved with the aid of a computer and a special "computer language" designed by their professor, a design problem previously considered difficult even for seniors).

Other installations, such as that used at the Lawrence Radiation Laboratory, Livermore, California, are planning systems with several hundred remote stations. This development will: (a) give the "game" back to the "players" (e.g., physicist at Lawrence Radiation Laboratory can have his own "computer" on his desk), (b) cost being little (with several hundred station, such as those planned by Bolt, Beranek and Newman's system for the Massachusetts General Hospital, $2 per hour per station for computer time would be a liberal estimate), and (c) hasten the time when there will be available a new public utility-an "information utility" capable of being "dialed up" by subscribers throughout the world and of making "logic" available at low, established rates (22).

Project developments such as these are currently being matched commercial announcements from several equipment manufacturers.

B. Input-output Developments

Input devices now in existence or in the offing include Optical Character Recognition (OCR) devices. These include numeric-line scanners, alphanumeric line scanners, page scanners (all three are single font scanners) as well as some multifont scanners. According to Manpower Report No. 7 (June, 1963) of the U.S. Department of Labor. These scanners are chiefly in use in the oil (gasoline credit card) companies, public utilities and insurance companies. The latter has usually employ the so-called "turnaround document method" in which the scanner is expected to read only a bill originally produced by the company, with nothing added. Error and reject rates vary. Rejections range

from as low as 0.1% in the turnaround billing application to as much as 20% in the plastic embossed credit card-produced invoice application. IBM's recently announced (April, 1964) system/360 includes the IBM 1231 Optical Mark Page Reader, 1419 Magnetic Character Reader, 1418 Optical Character Reader, and 1428 Alphanumeric Optical Reader. Control Data Corp's Service Bureau in Palo Alto is currently using an optical scanner for documents the size of magazine address labels and intends to use a machine capable of scanning sheets 8½" wide by fall, 1965. Last fall the Philco Corporation delivered to the U. S. Post Office Department an "engineering model" of equipment designed to "read" (and sort) mail by address and Zip Code. The Argonne National Laboratory, Argonne, Illinois, has used (as part of its CHOLE system) an optical film scanner successfully on a problem involving biological film data. Optical scanners are expected to be in operational use by the Post Office Department within three years, with the complete system (involving, also, auto-matic counters, weighers and sorters) in operation by 1969. (16) It should be noted here that Magnetic Ink Character Recognition (MICR) has been standard in the banking industry since 1956 for check handling.

Other input developments include "light pens" which are commercially available from IBM and the Digital Equipment Corporation, among others. These hand-held, pen-like devices can detect information displayed on a cathode ray tube, computer-output device and can, in turn, input signals to the computer to modify its displayed pattern. At M.I.T., the "sketchpad" system (involving a light pen and computer-output display tube) developed by Ivan Sutherland permits considerable flexibility in communicating with the computer and in using it as a "robot draftsman" to draw, quickly, an accurate version of what a human has merely "sketched" (22).

An interesting piece of software related to visual displays by a computer is the Bell Telephone Laboratories, BELFLIX, a general programming language for making simple animated films quickly and cheaply with a computer (11, p. 47).

Input to computers via Automatic Speech Recognition (ASR) is being studied in a number of laboratories. ASR was the subject of an Engineering Summer Conference at the University of Michigan, July 8-19, 1963.

C. Data Transmission

According to Mr. E. C. Gentle, Jr., (11,p11ff) present Bell System data communication services may be classified either as "dial-up" or "private line" services. Dial-up services include Data-phone (operating at speeds of 75 to 2000 bits per second), TWX (operating at speeds up to 150 bits per second) and Wide Area Telephone Service. Private line services include Telpak (capable of data transmission speeds from 40,800 bits per second to 500,000 bits per second). Telpak is designed to meet narrow band, voice band, and wide bard needs. Other private line services include facilities of voice grade and lesser bandwidths (operating at speeds up to 2400 bits per second).

5. The building should be built essentially as a shell, with all or most inner partitions non-load-bearing and movable (e.g., movable metal partitions).

6. Movable partitions should provide means of accepting power and signal conduit to them at about three feet above the floor.

7. Partitions can come in further modules, (e.g., shelf brackets can be bolted to partitions at joints between modules).

8. Floors should be laid either with parallel cable raceways about six feet apart, or with empty "junction boxes" laid in the floor six feet apart one way and ten feet the other. Alternatively, floors can be 8" higher than "standard", to allow later installation of false floors to hide needed power and signal cables.

9. The building can contain either a central utilities core with elevators, rest rooms, and conduits or four such cores, one on each outside wall extending half inside and half outside the building.

10. The lower floor could be air conditioned to: (a) preserve books, especially rare ones, which are a capital investment, (b) preserve magnetic tapes or their equivalents, (c) protect the working of optical scanning devices, and (d) serve as a book shelter.

11. Remote computer access stations can be located in the Learning Resources Center itself, in every classroom, in every office and even in dormitories. An experimental pilot program of remote stations could be initiated immediately, at modest cost, to assist in planning the nature of future developments along these lines.

12. Only input/output stations need be located in the building itself, providing for remote access to computers located in San Angelo, Washington, Oakland, or other buildings on the campus.

The flexible design outlined above, if implemented, would make it possible for a college to move in the direction dictated by economics and future technological developments.

SAGE. American Airlines automatic reservation system, con-
over special high speed phone lines at 3,000 bits per second (3).
Division of Sperry-Rand Corporation recently announced a new Sperry
Terminal which allows card processors to transmit or receive data
at rates up to 2,000 words per minute. In the report of its 1964
annual meeting, IBM announced experimental results in which about
6 million numbers per second were transmitted through broad band
television type channels.

9 Possible Future Developments

Microminiaturization techniques are being promoted in a nu-
places. Sperry-Rand (3) has compressed a big Univac computer in
6 inch box, for example. This was done with 1,000 microcircuits
only 1/100th the size of a transistorized circuit which accompli-
same things. Through the methods of Kinetics, scientists have co-
miniaturized circuits so small that 20,000 of them, each doing the
an ordinary radio tube, could be placed on a postage stamp (24).

Using superconductive substances, and vacuum deposition to
three men at RCA Laboratories in Princeton, N.J., have demonstra-
possibility of constructing high speed computer memories of mass,
10^3 bits capacity (7).

In an interview shortly before his death (26), the late g-
mathematician and founder of cybernetics, Dr. Norbert Wiener, w-
to give a look into future. He conjectured that the next decade
would see the development of computer memories whose elements and
stances allied to genes and that input and output problems for
computers can be solved by use of light of specific molecular ...

As long ago as May, 1960, a panel of "experts" at the Wes-
Computer Conference in San Francisco predicted that within ten
would be possible to "walk into a computer store" and, for the plus
new automobile, walk out with a computer the size of a golf ball
as large as a grapefruit. This computer would have the capacity of a
7030 (Stretch), a computer with up to 262,000 sixty-four bit wyte
storage and a 1.2 microsecond add time and would have the "intel"
of a fresh bachelaureate degree holder from college.

10 Implications for the Design of a Building to Be Operatively in 1970 by a Learning Resources Center

The hardware and software relating to digital computers
so quickly that it is patently impossible to make any definitiv-
as far as six years in advance. Nevertheless, certain patterns
from present knowledge of the states of the arts, from conversa-
consultants to the DEPLAN Project, and from the obligations of
to educate its students for living in a modern, automated socie-
of these touch on the kinds of activities which will be carried
Learning Resources Center and the Library:

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APPENDIX A

The Relationship and Criteria of Library and Audiovisual Facilities

CALIFORNIA STATE COLLEGE AT HAYWARD

PART II: STATEMENT ON RELATIONSHIP OF LIBRARY AND A-V SERVICES

I. Assumptions

The relationship of the two services is built on the following assumptions:

A. That certain of the traditional distinctions between the functions of the library and A-V Services are diminishing and will be more pronounced on the new campus, as evidenced by a facility housing both services in the same building.

B. That the areas of blurring distinction are related to the service provided staff and students in regard to:

1. Access to information about holdings (cataloging);

2. Access to the material itself (distribution);

3. The fact that content on a given subject is being "packaged" and uses more than one communication device.

C. That technical administration of the Library and A-V services, together with specific functions (construction of instructional materials), are distinct areas requiring specialized staff, skills, and training.

D. That there is and will continue to be an increasing use of non-book materials to which students are referred for individual study. Re-reflexive viewing and listening are taking their places along with non-reflexive reading. This will be increasingly true as teaching machines and electronic distribution of content grow.

E. That the Curriculum Materials Laboratory, with a primary function of assisting in the education of teachers, will be housed in the Library A-V Complex. To be effective, this center must be able to handle an extensive range of curriculum materials.

F. That the immediate needs of the library for electronic and mechanical storage and retrieval of information are limited to microformed materials and potential computer controls. Nevertheless, the building should be so planned that both services are parts of a central campus distribution system. Undoubtedly this central distribution system will be almost immediately involved in closed circuit T.V. and, shortly, in the campus distribution of films.

II. Physical Housing of the Collection of Instructional Materials

The needs of the students and staff are best served when careful thought has been given to the most appropriate space for deposit of material commensurate with administrative and economic necessities.

Instructional materials will be housed in various areas:

A. Departmental collections for materials used only by given departmental staff within the department's administrative and classroom space.

B. Special subject matter collections associated physically with related books (under the LC classification system).

1. The graphic arts collection of books and prints. Selected films and slides may also be available.

2. The music collection with books, scores, recordings, and possibly selected films.

3. Social sciences collection with appropriate map facilities.

4. The curriculum materials center with courses of study, research units, texts, teaching units, and recordings.

The problem of administration, circulation, and repair of the holdings of the Curriculum Materials Center are such that this unit should be located adjacent to the Art Services Center. Students and staff access to its material should funnel through library channels; administration of its collection should be a shared function worked out for various types of materials.

III. Study Spaces

A. The Library Arts building should be constructed so that appropriate study spaces are provided for:

1. Reading areas, associated with the major library areas.

2. Listening and viewing spaces associated with the areas housing non-book materials:

a. fine arts
b. music
c. social sciences
d. curriculum materials

3. Micro-format reading rooms, including reproduction and enlargement facilities.

IV. Problems and issues. Several issues are raised by the integration of selected library and A-V functions.

A. Because of the pattern of budgeting in California state colleges, it seems wise to maintain funds for the acquisition of materials in three budget categories, as follows:

1. <u>The Departmental Budget</u>. Materials may be acquired through any department budget and be subsequently deposited, for longer or shorter periods within the Library or the Division of Learning Resources.

2. <u>The Audiovisual Services Budget</u>, or
3. <u>The Library Budget</u>. This sharing of responsibility for the acquisition of instructional materials requires a formal statement of purpose and a continuing discussion of specific materials to avoid unnecessary duplication. However, it implies that some duplication is probably necessary to best serve the needs of students and staff.

B. Photographic and other duplication services. The Library would have access to the photographic and other duplication facilities of the A-V materials preparation section. However, single reproduction equipment (such as reflex copy equipment) may be located in several spaces in the library, primarily for administrative use.

C. Responsibility for selection, planning, and balance of the overall collections is not the exclusive province of either the Library or the Division of Learning Resources. There is a shared campus-wide responsibility inherent in the present allocation system. Suggestions for modification and acquisition would be channeled through the appropriate head of either service.

D. Supervision of the personnel would be the responsibility of the head of the service to which the person is assigned.

Part II: CRITERIA FOR LIBRARY PROGRAM IN PROPOSED LIBRARY - AUDIOVISUAL BUILDING

1. At no time can the book collection within the Library program be considered to be complete. The eventual Library facility is being masterplanned for 15,000 FTE. Any increase in this projection or major expansion of materials within this enrollment ceiling will necessitate satellite library facilities or expansion.

2. Modular construction will allow flexibility in locating of shelving, study areas, or re-location of functions.

3. Students should be provided with individual areas for study wherever feasible and possible. This will require that all walls be designed so that individual study carrels can be installed adjacent to them.

4. The Library should provide rooms for group study or for classes to meet and utilize library materials. These areas will also be used for library orientation or academic seminars. It should be clearly understood that these are not assigned classrooms. This will require:

   a. Separate rooms located adjacent to the different subject areas and removed from the open study areas.

   b. Special equipment such as chalk board, map rails, screens, and soundproofing.

5. It may be necessary to provide regular classrooms for a needed librarianship or Audiovisual minor.

6. The library should provide typing areas for student and faculty use. This will require:

   a. Soundproofed rooms equipped with special counters.

   b. A typing room to be located on each floor of the library.

   c. That these spaces be removed from main study areas.

7. The Library should provide for reading and study of materials in micro-format. This will require:

   a. Rooms designed with special counters to house the various types of reading machines.

   b. A lighting plan that provides individual lights at each station and a dim light overhead.

c. Facilities for rapid printing and enlarging of micro-format materials for student and faculty study outside the "micro" area.

8. Within the Library program, students and faculty should be provided immediate access to the total Library periodical and document collections. This will require:

   a. A large area capable of expansion, to house the periodical collection. This area should be equipped with reading facilities for micro-format materials.

9. The Library-Audiovisual program should provide listening facilities as an enrichment of the music program and to allow the non-music majors access to music literature. This will require:

   a. Individual and group listening rooms with good electronic reproduction equipment located adjacent to the music library book and score collections as well as the records. These rooms should be soundproofed and removed from the student study area.

10. Within the Library program provision should be made for student study of art slides. This will require:

   a. A special room or rooms equipped for the study of various slides.

   b. A location relatively close to the Fine Arts reference area, as the librarian in the area, who will have an Academic background in the Fine Arts, will assist in the implementation of this phase of the library program.

11. General provision should be made for blind and paraplegic students. This will require:

   a. Ramps

   b. Elevators

12. The library should provide special areas for faculty use only. This will allow faculty library use without interruption by students. This will require:

   a. A room centrally located in the library.

   b. Special closed carrels for faculty study and research.

13. One library collection inevitably includes materials that should be housed in an area separate from the main collection. This will include materials that are rare, expensive, subject to thievery because of content, or archival in form. Of necessity, these must be secured in a separate area within the Library and include both

rare books and the college archives. This will require:

a. A secure room with special shelving and equipped with work space for at least two persons.

14. Certain materials used regularly by the library staff and, to a lesser extent, by students and faculty should be readily available to both. Materials represented in this category are the Library of Congress Author Catalog of Printed Cards, Cumulative Book Index, etc. This will require:

a. An area adjacent to the technical processing department and the main public card catalog. It will have to be large enough to serve both library personnel and the public.

15. Two services provided by the Library that cause heavy traffic are the circulation of books for an extended period and circulation of books on a reserve basis. This will require:

a. A main circulation desk to charge out and receive books. This should be located close to the main entrance and designed so as to direct patrons past it when leaving the building.

b. That this main desk be removed from the study area, as considerable disturbance is frequently associated with this area.

c. That this area should have ample space to absorb the eventual traffic that will result from 15,000 F.T.E.

d. That the Reserve Book room should be adjacent to this area and also to a reading room for use of reserve materials.

16. The library staff will eventually number more than 100 full-time positions, thus an area will be required for coffee-break, smoking, and lunch. This is particularly essential as the library is open evenings and weekends and the library staff may not have access to the college cafeteria or union. This will require:

a. A room removed from all public activities.

17. Somewhere within the Library-Audiovisual complex a smoking area should be designated. A suggested possibility is a roof terrace. This could serve the dual purpose of a smoking area and outdoor study area. If an area is not provided for smoking within the building, students will inevitably utilize stairwells and entryways as a substitute.

18. Administrative Offices, including a conference room, are necessary to effectively integrate the total library program. These should

be located near the front entrance. This will require:

a. Offices of Director of Library and Secretary

b. Conference room

c. Possibilities of expanding into adjacent area for additional office space.

19. Items of a general nature that cannot be elaborated on are the following:

a. The elevators or escalators should not be the core of the building, as this dictates to a great extent the utilization of space.

b. The total building should be prepared for automation and communication. Every known provision should be made to anticipate utilization of new methods to improve on library services. (See recommendations in final section of chapter on The Role of Digital Computers.)

c. So as to avoid unnecessary traffic, separate entrances should be provided for Library and Audiovisual patrons, and College administrative offices.

PART III: CRITERIA FOR THE PROGRAM OF THE DIVISION OF LEARNING RESOURCES IN THE PROPOSED LIBRARY - AUDIOVISUAL BUILDING

1. Administration Area

   Administrative and clerical work are necessary to make the services function smoothly. The A-V Service at Cal-State, Hayward should be built to provide for the following:

   a. Conference and planning with instructional staff.

   b. Office routine related to booking, scheduling, and ordering.

   c. Administration of the Learning Resources program.

   These functions would require:

      1. Office space for the Director of the Division of Learning Resources

      2. Office space for Coordinator of Utilization of Materials Section.

      3. Office space for booking and scheduling clerks, secretary and staff room.

2. Materials Preparation

   To prepare instructional materials not easily available by purchase (including materials for instructional television) the Learning Resources Center should be built to provide for the following functions:

   a. Preparation of graphics, including layout design, lettering, mounting and illustration.

   b. Provision for duplication and reproduction of materials from books, lettering, drawings, etc.

   c. Preparation of photographic materials including transparencies, slides, micro-filming, print making, etc.

   d. Dark room facilities for developing, enlarging, loading, and chemical mixing.

   e. A display construction area for backdrops, table top copy, relief maps, painting, etc. Properly designed this room would serve the needs of the television studio mentioned elsewhere.

   f. A sound recording area for preparation and duplication of listening materials. Properly designed this room would serve needs of the television studio mentioned elsewhere.

These functions would require:

1. Office space for Coordinator of Production Services, Photographer, Graphic Artist, and Student Assistants.

2. Work Space: model shop (for construction of 3-D instructional devices), spray booth, storage, wet lab, dry lab, loading room, chemical room, camera studio, duplicating room, graphic preparation room, sound studio, sound duplicating and control rooms.

3. Campus Utilization of Audiovisual Equipment and Material

The needs of the instructional staff for campus-wide services in their classroom would be met from this facility and serve the following functions:

a. Campus circulation for equipment.

b. Inspection, maintenance, repair, replacement of equipment.

c. Storage of equipment and materials.

d. Shipping and receiving.

e. Public address needs.

These functions would require:

1. Office space for 2 Technicians, 1 clerk-typist, several student assistants.

2. Work space: ground level loading dock, public reception area for will-call, materials inspections and repair area for films and other A-V materials circulated through curriculum materials center, night depository for late deliveries, cart storage -- including electrical carts, mechanical shop and electrical shop (should accommodate television repair mentioned elsewhere), equipment storage, and material storage.

4. Television

In line with the report of the Chancellor and the Trustees, "Television for the California State College", the Instructional Materials Services at California State College at Hayward should be built to provide the following functions:

a. Image magnification and other related T.V. teaching aids.

b. Observation services for teacher education.

c. Closed circuit educational television broadcast (minimum Phase 1-b of the above report, 12 hours per week plus possible expansion).

d. Inter-institutional exchange of televised instruction.

e. Possible future television broadcast.

These functions would require:

1. Office space for personnel: Coordinator of T.V. Services, Chief Engineer, Stenographer, Program Supervisor, Graphic Artist, Engineer, Student Assistants.

2. Studio and Equipment Space: 1 large studio, 1 rehearsal studio, 1 video tape room, 1 large control room, 1 small control room, 1 distribution equipment room, 1 scene construction dock, expanded facilities in Graphic Arts area described elsewhere, storage facility, expanded equipment repair facility described elsewhere, storage for mobile truck (preferably not in building).

5. Independent Study Center and Work-Space Areas

This area should provide listening and viewing facilities for students on assignment of the instructor as follows:

a. Individual study.

b. Small group.

c. Class-sized group on outside viewing assignment.

d. Other facilities for use of programmed materials, including spaces for (a) test and program development, (b) program try-out, (c) testing of students, (d) test scoring, and (e) storage.

These functions would require:

1. Office space for personnel assigned to supervision of study area and technician for equipment operation.

2. Work space: a number of individual study carrels equipped for listening and viewing; several small, group-sized rooms; and at least two classroom-sized rooms.

3. Interconnection with the computer service with study carrels especially equipped for computer controlled display.

6. Audio Laboratories

Certain of the listening and recording facilities are specialized services associated specifically with a particular function. For

example, the Language Laboratories for instruction in foreign language which is not part of this building. Other audio facilities serve a college-wide function and are a part of the requirements of this building.

The Instructional Materials Service at California State College at Hayward should be built to provide for the following functions:

a. Class-sized groups for listening.

b. Individual listening spaces

c. Central programming of testing material.

These functions would require:

1. Office space for technicians and student assistants.

2. Work spaces for: recording, distribution, and production (properly designed, these spaces would also serve utilization and television mentioned elsewhere).

3. Sound treated booths for class and individual listening and recording.

7. Central Campus Secretarial Services and Duplication Facilities

This area should provide members of the instructional staff with:

a. Help in preparing tests, bibliographies, course outlines, and certain other materials not available through printed sources.

b. Access to automatic dictation equipment for reports dealing with student teachers, visits, reports on interns, and other class-related needs for dictation.

These functions would require:

1. Office space for personnel assigned to supervision of the clerks, technicians and student assistant working for the Center.

2. A reception area for meeting staff. This area would primarily serve the needs of "will call" service, and an area for meeting instructional staff.

3. Storage space for quantities of paper, stencils and other material needed in this operation.

4. Work space for desks, typewriters, duplication equipment, automatic recording equipment.

8. Central Campus Electronic Distribution

Provisions are being made for the intercommunication of all campus buildings and most rooms.

The Instructional Materials Services at California State College at Hayward should be built to provide for the following functions:

a. Central distribution to individual student study and preview center, and possibly to residence halls.

b. Campus distribution of closed circuit T.V. to classrooms, center for independent study and residence halls.

c. Central distribution to library listening and viewing center.

d. Campus recording service.

e. Eventual electronic distribution of film.

f. Eventual electronic distribution of library materials.

These functions would require:

1. Office space for technician, student assistant.

2. Work space for electronic distribution equipment.

APPENDIX B

Function -- Space Requirements

for

Educational Facilities - Library - Learning Resources

CALIFORNIA STATE COLLEGE AT HAYWARD

Section I

CRITERIA FOR PLANNING LEARNING RESOURCES

AT CAL-STATE - HAYWARD

A large proportion of the students at Cal-State in 1972 will be commuters. College residence halls will house, at the most, ten to twenty percent of the students. Privately-owned residence halls near the boundaries of the campus may provide for another ten to fifteen percent of the students. Thus, twenty to thirty-five percent of the students (at most 1,600 - 3,000 FTE) may have study space available in their rooms and in special study rooms. Low-power, multi-channel TV could reach many of them with cultural programs and programmed, video-taped class instruction. Commuting students (at least 5,000 - 6,000 FTE) coming from early morning until late at night will need study space on campus. With many courses or parts of courses "programmed" there will be a need for spaces in the individual study center. Since possibilities exist in the various fields of knowledge, it is not yet apparent that special carrel space is needed for students in various majors. No remedial courses are offered at the college, but opportunity for personal improvement has been, and should continue to be, offered in beginning foreign language, mathematics, communication skills and chemistry. The "mix" of students in 1972-3 should be forty percent lower division, fifty to fifty-five percent upper division and five to ten percent graduate students. A wide variety of cultural, ethnic and economic backgrounds are, and will continue to be characteristic of students at CSC-H. At present quite a number have experienced "team-teaching" in high school but not much through automated instruction. Since all students will be from the top third of the high school graduates, they will be a capable, relatively adaptable group. By 1972-3 great numbers of students and limited capital funds will have pushed many classes into evenings, early mornings and Saturdays. Operations could easily be required from 7:00 or 7:30 a.m. to 11:00 or 12:00 p.m.

Faculty at Cal-State, Hayward will be diverse and over three times as numerous as in 1964-65, (between 600 and 650). The graduate school will offer many more major fields of study and the under-graduate majors will have added several specializations. The college exists legally as a teaching institution. However, many capable, creative faculty will need assistance with their continued scholarly study and research interests. Many present faculty take for granted the use of learning resources. An increasing number of faculty, coming from forward-looking graduate schools, will be impatient with teaching of elementary, factual, rote coursework and will expect students to be able to learn much of it "on their own." A faculty of this number, and with relatively recent training, will have wide interests and capabilities in use of all types of learning resources.

The local definition of learning resources is comprehensive. Many campus units which are not directly instructional will need to use facilities of such a center.

Future community uses of the Learning Resources are difficult to determine at the present time. College facilities are basically for the on-campus program. However, as a public institution, with a regional responsibility, the college must consider, and where possible meet, the needs of the surrounding region. Professional groups in the area will undoubtedly meet on the campus and need to use the college services. On the other hand, school districts in the area have excellent film and filmstrip libraries -- so there is no need to plan a "rental" service such as that offered by such institutions as the University of Indiana or the Washington State University. The campus learning resources center should function as a demonstration center and might house special collections for specific types of use.

However, in the final analysis services for the campus are the prime responsibility. The autonomy of the college makes it possible and necessary to make complete provision for needed campus services before off-campus service is considered.

Section II

SPACE REQUIREMENTS - COLLEGE LIBRARY

The college is being masterplanned for 15,000 FTE. However, since existing policy regarding the planning of such facilities limits us in over-planning, with regard to space needs, to a 3-year period beyond initial date of occupancy, Phase I is predicated upon 8,260 total FTE, which is the projected FTE for 1972.

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The college has been authorized by the Trustees of the California State Colleges to use the formula of 40 volumes per student. On this basis, the library collection should reach 331,000 volumes in 1972.

California State College library standards provide seating space for 25% of the total FTE. It further provides 25 square feet per study station for the computed FTE figure. Additional area equal to 25 percent of the bound volume area is provided for housing special material such as unbound periodicals, maps, courses of study and sample textbooks.

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SPACE FOR PERSONNEL

Personnel space by formula is allotted the following:

		Projected Personnel	Total
Administration	150 sq. ft.	3	450
Admin. Conf. Room	150	1	150
Secretary-Recp.	160	1	160
Technical Serv:			
Division Head	150	1	150
Department Head	110	4	440
Asst. Catalog Libr.	110	3	330
Asst. Order Lbr.	110	3	330
Serials Libr.	110	2	220
Documents Libr.	110	2	220
Clerical - per position	80	15	1,200
Public Serv.:			
Division Head	150	1	150
Department Head	150	6	900
Reference Libr.	110	6	660
Special Services	110	2	220
Circulation Libr.	110	1	110
Clerical - per position	80	11	880

Public Services Points:			
Per Librarian's Station	125 sq. ft.	8	1,000
Per clerical station	80	8	640
		78	8,210

SUMMARY

Function	Square Footage
Bookstack area (331,000 volumes @ 0.10 per volume)	33,100
Special materials (25% of bound volume area)	8,250
Readers' stations (25 sq. ft. per station for 2570 of FTE)	51,625
Personnel Space	8,210
Total	101,195

SPACE FOR FUNCTIONS

	Square Footage
I. Reading Spaces	
A. General	12,000
Dispersed study spaces relevant to the various disciplines represented in the library collection.	
B. Reserved Book Reading Room	2,400
This area restricted to study of materials placed on reserve by faculty.	
C. Study Carrels	2,000
Individual study units designed for student and faculty use.	
D. Seminar and/or group study areas.	1,350
These areas are designed for use by study groups or classes to study and discuss library materials.	

	Square Footage
E. Periodicals Reading Room	3,500
This area is designed for the utilization of periodical literature which relates for a limited period of time.	
F. Reference Room	9,000
Study areas are required to utilize reference material.	
G. Faculty Reading Room	625
This space designed for faculty members who wish to study without student interruption.	
H. Serials and Documents	6,000
This area directly related to these materials.	
I. Evaluation and curriculum materials	6,000
This area will be utilized to house the education collection and all curricular materials. The latter will include text books, educational pamphlets, school curriculum guides, newsletters and teaching aids.	
J. Visually Handicapped	225
This room will have small collections of special material.	
II. BOOK STACKS	31,100
The library collection will be separated by the major disciplines, as represented by the divisional nature of the college academic organization. The actual location of these stacks will depend upon the architectural design of the building.	
III. SPECIAL FUNCTIONS	
A. Audio Rooms	625
Tapes and recordings housed in the library are played in these special facilities. Such materials are used in support of the instructional program in Humanities, Creative Arts and Science and Behavioral Sciences.	

	Square Footage
B. Micro-format Room	275
Library materials such as newspapers, books and documents reproduced in micro-format, will be used in this area.	
C. Map Room	400
An area designed to meet the specialized needs (variety of sizes and weights) required in the study and reproduction of maps and charts.	
D. Bibliography Room	625
This area will be reserved for all bibliographies used to identify materials for study or purchase. It will be used by students, faculty, and library staff.	
E. Newspaper Reading Area	400
This area is devoted to reading of newspapers and should be located adjacent to periodical reading room. Considerable noise and traffic can be expected in this location.	
F. Art Prints and Slides	300
This area, with special lighting, will be devoted to the study of art prints and slides, principally in support of the Art program.	

IV. NON-STUDY SERVICE AREAS

A. Card Catalog

1. Main Card Catalog — 625

This catalog represents all the material located in the college library by author, subject and title. Located adjacent to main circulation desk, entrance and technical processes.

2. Subject and special material catalogs, separate catalogs representing divisional libraries, and special material such as tapes, phono-discs, curriculum materials, and slides will be located in the various areas where these materials are located.

	Square Footage
B. Circulation Areas	
1. Main Circulation Desk	625
All records relative to circulation of library materials are maintained in this area. Materials are also checked out in this area as well as in the various divisional and special material areas. All materials in circulation are returned to this area.	
2. Circulation desks in divisional and special material areas	1,200
Circulation facilities will also be located in each divisional and special material area. These areas will be located adjacent to the material and study area relevant to the respective disciplines.	
C. Typing Rooms	1,056
These soundproof rooms will be located in each divisional and special materials area. These areas are of considerable importance in areas where materials do not circulate or have limited circulation.	
D. Rare Books and Archives	625
Materials in the library which are extremely expensive, rare, fragile and are subject to theft are controlled and will circulate only on request. This area also contains the college archives collection. This area should be located in the general area of the main circulation desk.	
E. Browsing Area	625
This area should be located off the lobby and will have new and general interest material. Special furniture for informal reading should be provided.	
F. Phono-Disc Collection	625
These materials have restricted circulation and will be located at either an audio-control center where all discs and tapes are played, removed	

Square Footage

from the listening area, or at the circulation desk adjacent to the listening areas. This function may be dispersed between the Fine Arts, Humanities and Social and Behavioral Sciences.

V. TECHNICAL PROCESSES

This area should be immediately adjacent to the main card catalog and the bibliography area. The following functions exist within this area.

A. Order Development 1,500

All library materials are purchased from this area.

B. Receiving 1,000

This area is part of technical processes but should be located near the service entrance, removed by a solid wall from the rest of the technical processes area.

C. Cataloging 1,500

D. Book Repair 300

To be used for mending and repair of all library material.

E. Storage Area and Binding Preparation 1,000

This area will provide space to store gifts received by the library prior to processing. Storage and preparation of materials for binding will also be done here. This area should be located near the service entrance.

F. Supply Room 264

There is a decided need for a locked area within the library to store all supplies. These pertain to all phases of the library operation including cards, pockets, stationery, pencils, glue, etc.

G. Copying Service 375

Service in this area will include book copying, card printing, etc.

	Square Footage
H. Computer Area	800

"When an institution gets above 10,000 students and has a book purchase budget of around $150,000 a year, and a collection of 300,000 or 400,000 titles, it has reached the point at which it warrants a small-scale computer exclusively for clerical processing." (From Libraries by Alvin Toffler, in Bricks and Mortarboards, Educational Facilities Laboratories, Inc., 1964.

VI. GENERAL AREAS

A. Lobby	1,000

Located at the main entrance and large enough to absorb considerable traffic. Related areas are:

Main Circulation
Main Card Catalog
Bibliography Area
Administrative Offices
Reserve Book Reading Room

B. Smoking Room	625

It is advisable to provide a room to control smoking and keep it out of the halls and stack area.

C. Staff Room	625
D. Stairwell, Elevator Shafts, Escalator, Mechanical Room, Maintenance, Restrooms	10,000

These must be located on the periphery of the building.

Total	101,195

Section III

SPACE REQUIREMENTS - LEARNING RESOURCES CENTER

The college is masterplanned for 15,000 FTE. Overplanning is limited to a 3-year periodbeyond initial date of occupancy. Therefore, the following projection of requirements is predicated upon an FTE of 8,260 which has been projected for 1972, assuming occupancy in 1969.

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The requirements for space and personnel presented here are based initially on standards for audiovisual programs which have been in effect in California State Colleges over a period of years. These were blanketed in as existing policies of the Trustees of the California State Colleges when that group assumed the administration of the colleges.

These initial standards have been modified in this report to include revisions proposed by the California State College Audiovisual Directors, as outlined in Appendix C.

Further modifications of the initial standards were made for the expanded concepts of a "Learning Resources Center," as contrasted with a more limited concept of an "Audiovisual Center." These concepts were not covered in either of the above lists. No consideration was given, for example, to auto-instruction, programmed materials, television production, language laboratories, or secretarial and duplicating pools as functions of "Audiovisual Centers." These are important activities in a "Learning Resources Center"; therefore, they are reflected in this estimate of space.

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Space allocation for personnel follow the square footage recommendations adopted for the library -- 150 sq. ft. for Administrative personnel; 110 square feet for supervisory personnel; and 80 sq. ft. for clerical and technical positions.

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I. THE ADMINISTRATIVE AREA

This space needs to be located for easy access by the college instructional staff. It will house the office of the Head of the Division of Learning Resources (150 sq. ft.); the secretary to the Division Head (110 sq. ft.); the office of the Coordinator of Utilization (150 sq. ft.); and the office of the Division secretary (110 sq. ft.). All of these offices need physical and electronic interconnection.

As the initial contact area for the college instructional staff, there should be space for the functions of a catalogue and reference area (150 sq. ft.); a booking and scheduling area (150 sq. ft.); and a reception area (100 sq. ft.) These three services need to be located adjacent to each other and should be close to the public catalog and circulation areas of the library. Within this area space should be provided for two clerical positions (2 x 80 = 160 sq. ft.)

Two conference rooms should be provided to double as staff preview rooms (2 x 300 = 600 sq. ft.) Three small individual preview rooms (3 x 100 = 300 sq. ft.) should also be available. These conference and preview rooms are needed to serve consultation functions of the Center with professional staff members of the college.

Space for personnel	680 sq. ft.
Space for function	1,300 sq. ft.
Total space	1,980 sq. ft.

II. MATERIALS PREPARATION

This space should be located so that the office of the Coordinator of Materials Production (150 sq. ft.) has easy access to the Divisional conference rooms and the divisional secretary. Space for photographic and graphic assistants (2 x 80 = 160 sq. ft.) should be closely related to the office of the Coordinator.

Photographic and duplicating process rooms should be located together to facilitate the preparation of masters from paste-ups. These areas include a film processing room (500 sq. ft.); a film printing room (600 sq. ft.); a print finishing room (600 sq. ft.); a loading room (150 sq. ft.); a chemical and film room (200 sq. ft.)

The graphic reproduction room (600 sq. ft.) should be vented for ammonia process equipment. This should be located next to a graphic layout and preparation room (400 sq. ft.) for lettering and sign making. Associated with this larger layout room should be two small work rooms for the graphic artists (2 x 150 = 300 sq. ft.)

A model shop for construction of 3-D instructional devices (1000 sq. ft. with a minimum ceiling height of 14 ft.) will contain equipment which makes noise and should be located away from quiet areas but adjacent to truck delivery service and the TV studio. This shop should have access to a spray booth (200 sq. ft.)

A small sound studio (150 sq. ft.); associated with a control room (80 sq. ft.) and a dubbing room (110 sq. ft.); should be located together near the TV complex.

Space for personnel	310 sq. ft.
Space for function	4,890 sq. ft.
Total space	5,200 sq. ft.

III. UTILIZATION SERVICES

Space for personnel concerned with coordination, reception, catalog reference, booking and scheduling has been accounted for under Administration above. A small "ready room" (240 sq. ft.) needs to be associated with the equipment and delivery area for use of student assistants serving campus utilization. An office for the supervising technician (110 sq.ft.) should be provided.

This utilization area should be located so that it forms part of the tie between the library -- specifically the curriculum materials section of the library -- and the Learning Resources Center. Both students and staff will come to the catalog section of the library to locate material. The curriculum section of the library will house and circulate print type materials. The utilization section will house, repair, and make available for circulation through the curriculum materials library non-print material which is booked by students for use in student teaching, etc. Material for on-campus use by instructors will be handled directly through the utilization service.

Since the utilization service circulates material and equipment to all instructional departments in all buildings on the campus, it is imperative that the following services be located on the ground floor near access roads and walks: Cart storage (150 sq.ft.); receiving and shipping for rental films and materials (150 sq. ft.); night depository for evening deliveries (100 sq. ft.)

The utilization service operates on both a "scheduled" and "will call" basis. The will call function (100 sq. ft.), should be located adjacent to the traffic flow to the reception area in the administration area above.

A mechanical shop (300 sq. ft.) and an electrical shop (300 sq.ft.) should be located near incoming and outgoing areas for delivery. Preferably, these shops should be so located that they serve the needs of television mentioned elsewhere. Space for an equipment technician (80 sq. ft.) should be associated with this shop.

Adequate storage is needed for film -- including inspection (400 sq. ft.) study prints, film strips, recordings, and other material (300 sq. ft.)

Adequate storage for circulating equipment (800 sq. ft.) should be associated near the electrical and mechanical shops and the service exits.

Six individual preview rooms (6 x 4 x 8 - 192 sq. ft.) should be associated adjacent to materials storage area.

Two model classrooms (2 - 900 - 1,800 sq. ft.) equipped with the necessary tools for modern instruction should be located between the curriculum materials library and the utilization services area. These two classrooms are available on a booking basis to any instructor who needs to use them for selected classes.

Space for Personnel	530
Space for Functions	4,592
Total space	5,122

IV. TELEVISION SERVICES

Space for the coordinator of television services (150 sq. ft.) should be provided which will give access to the conference rooms requested in I above. Associated with the office of the coordinator should be space for clerical personnel (80 sq. ft.); a program supervisor (110 sq. ft.); and other technical personnel (2 x 80 = 160 sq. ft.) The engineer would have an office located near the control and tape room of the studio (110 sq. ft.) Graphic and photographic personnel would be located within the facilities described in II above.

Two studios should be planned: one large (2,500 sq. ft.), and a second smaller rehearsal studio (1,000 sq. ft.) Both studios should have a minimum ceiling height of 18 feet. Between the studios should be a control room (200 sq. ft.) and a video-tape room (150 sq. ft.) and a video distribution equipment room (400 sq. ft.) for belop and film equipment. Properly located, the Sound studio and control room described in II above can be related to this area.

The facility should have a scene construction dock (1,200 sq. ft.) which is located adjacent to the 3-D model shop described in II above. This scene dock should have large double doors providing roadway access and opening out on the loading dock and the TV studio.

Due to the specialized nature of the electronic repair problems, the size of the electronic repair shop described in III above should be doubled (add 300 sq. ft.)

Parking facilities for a mobile TV truck should be provided, but preferably not in this building. Reserved parking for the truck, however, should be provided adjacent to the building.

Space for personnel	690 sq. ft.
Space for function	5,750 sq. ft.
Total space	6,440 sq. ft.

V. INDEPENDENT STUDY CENTER

The Independent Study Center must be related to student traffic flow, but the office of the Coordinator (150 sq. ft.) need not be associated with the office of the Head of the Division. However, if the office is not in physical juxtaposition to the administrative complex described in I, a conference room (250 sq. ft.); space for clerical help (80 sq. ft.) and teaching assistants (110 sq. ft.) should be provided.

Approximately 410 automated study carrels (of various levels of sophistication) should be provided to serve both the study and testing functions of the center. Carrels should be in a loft-type structure designed to accommodate partitions providing 16 "rooms" containing various levels of equipment depending on the assignment of the professor. These study carrel spaces are comparable to "laboratory" space as contrasted with "library" space since students may pursue courses -- or parts of courses -- for credit. Therefore, this space is not necessarily a substitute for "reader stations" in the library*. Space is provided in each room for approximately 26 carrels, (4' x 6' x 26 = 624 sq. ft.); aisle space (228 sq. ft.); crawl space (160 sq. ft.); supervision space (90 sq. ft.) for a total of 17,760 sq. ft.

Testing is a necessary part of the Independent Study Center since courses -- or parts of courses -- are offered for credit. A test scoring room (800 sq. ft.); a storage room (80 sq. ft.) and a technical assistant space (80 sq. ft.) must be provided.

Space should be provided for program development, program try-out and testing. Three rooms (3 x 150 = 450 sq. ft.) would be used in program development; two rooms (2 x 250 = 500 sq. ft.) in program try-out and demonstration. Two offices, together with a small file and storage area, for psychologists and psychometrists should be located near these development and try-out rooms (100 sq. ft.)

Space for personnel	640 sq. ft.
Space for function	20,038 sq. ft.
Total space	20,678 sq. ft.

* "Instructional use" of the study carrel must not be confused with the concept of an "office away from home" which the student rents. Should this concept be incorporated, an additional 100 carrels should be provided.

VI. AUDIO LABORATORIES

Many of the functions of this service are distributed with specialized units of the campus, e.g. the language laboratories in the humanities complex, the music listening in the music building, and the auditory capabilities of the independent study center. Nevertheless, certain facilities must be available within the Learning Resources Center for sporadic, college-wide use.

Space must be provided for the coordinator of audio laboratories (150 sq. ft.) near the conference rooms described under I above.

The classroom-sized spaces, the small group-sized spaces, and the automated individual student carrels described elsewhere under other services in the Center will be so equipped that they may be booked for purposes of listening.

In addition to the flexibility provided above, the listening laboratories would need a 36-student station lab equipped for level three use (900 sq. ft.) which would be available to all other academic departments -- not excluding foreign language.

Space for Personnel	150 sq. ft.
Space for Function	900 sq. ft.
Total Space	1,150 sq. ft.

VII. DUPLICATION FACILITIES AND SECRETARIAL SERVICES

Of necessity the duplication facilities and the secretarial services must serve not only the needs of instruction but the needs of the college administration as well. There are economies involved if the service is to have access to the specialized graphic and photographic personnel in the Division of Learning Resources. By agreement with the State Printing Office, duplication facilities will not include major printing press capabilities.

Space must be provided for the supervisor of the duplicating service (110 sq. ft.) and the temporary help and student assistants which are employed (80 sq. ft.) The work area (1,200 sq. ft.) should accommodate multilith, mimeograph, and spirit duplication; collating, folding and stapling and binding equipment; light table and arc equipment for stencil and plate production; and a reception area to accept incoming and will call work. Storage space (80 sq. ft.) should be provided for paper stock, stencils and other necessary supplies.

A special room (350 sq. ft.) should be provided for camera copying and plate-making. This facility would be shared with the materials production center described in II above.

The space provided for the secretarial service should include an office for the supervisor of the service (110 sq. ft.) and five clerical positions (5 x 80 = 400 sq. ft.) The work area should include space for the automatic telephone recording equipment (400 sq. ft.) and storage space (300 sq. ft.) for paper, stencils, masters, office records and supplies.

Space for personnel	700 sq. ft.
Space for function	2,330 sq. ft.
Total space	3,030 sq. ft.

VIII. CENTRAL ELECTRONIC DISTRIBUTION SERVICES

The Division of Learning Resources is responsible for certain logistic functions which because they cross into activities in several fields, are difficult to assign to any given area. Electronic distribution of messages for the purposes of instruction is an area of prime importance to the total concept of the Center. For purposes of this report the function has been assigned a separate category directly under the Head of the Division of Learning Resources. It would require the following space provisions: conduit, crawl space, and duct space to facilitate the interconnection of rooms and functions within this building and with all other buildings on the campus; and electrical closets within this building serving the needs of instruction (estimate 100 sq. ft. per floor, 8 floors equals 800 sq. ft. Space for a technician to control and maintain this distribution complex (110 sq. ft.)

Space for personnel	110 sq. ft.
Space for Function	800 sq. ft.
Total space	910 sq. ft.

SUMMARY OF SPACE NEEDS

PERSONNEL SPACE

I.	Administrative Area	680 sq.ft.	
II.	Materials Preparation	310 "	
III.	Utilization Services	530 "	
IV.	Television Services	690 "	
V.	Independent Study Center	640 "	
VI.	Audio Laboratories	150 "	
VII.	Duplication facilities and Secretarial Services	700 "	
VIII.	Central Electronic Distribution	110 "	
	Total		3,810 sq.ft.

FUNCTION SPACE

I.	Administrative Area	1,300 sq.ft.	
II.	Materials Preparation	4,890 "	
III.	Utilization Services	4,592 "	
IV.	Television Services	5,750 "	
V.	Independent Study Center	20,038 "	
VI.	Audio Laboratories	900 "	
VII.	Duplication Facilities and Secretarial Services	2,330 "	
VIII.	Central Electronic Distribution	800 "	
	Total		40,600 sq.ft.
	GRAND TOTAL		44,410 sq.ft.

APPENDIX C

PROPOSED REVISION OF POLICY FOR AUDIOVISUAL SERVICES IN CALIFORNIA STATE COLLEGES

The material in Appendix C was prepared by the Audiovisual Directors of the California State Colleges and completed in May, 1962. It is based on the experience of this group of Directors (15 in number) in the application of the 1956 document, "Policies of Audiovisual Services in California State Colleges" which had been used for budgeting purposes by the State Department of Education and the Department of Finance of the State of California. The revision is still in the process of study, but, in the judgment of the Principal Investigator of this project, represents one of the most carefully thought out formulas and assignments of responsibilities for the combined audiovisual services in higher education.

As stated in the preface, it does not provide sufficient specific detail for television services, Independent Study Centers and Programmed Learning and other publication services which may be a responsibility of developing Learning Resources Centers.

A PROPOSED REVISION

of the

POLICY FOR AUDIOVISUAL SERVICES

in

CALIFORNIA STATE COLLEGES

Prepared by the
Audiovisual Directors
of the
California State Colleges
May, 1962

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PREFACE

In 1956, a "Policy for Audio-Visual Services in California State Colleges" was submitted to, and adopted by, the Council of State College Presidents. That report helped to give direction to each of the state colleges as its audio-visual program was established, or more fully developed. Experience gained in the last six years has indicated that certain roles, responsibilities, and staffing guidelines, under which the audio-visual service has operated, require clarification and revision.

In part, this revision has been made necessary by the series of major problems being faced by the state colleges -- increased enrollments, shortages of qualified instructors, and the need to teach increased amounts of subject content. The resources of technological communication with which an audio-visual service is concerned are seen as one approach to the solution of these problems. Provisions for increased independent learning by students, facilitating large group instruction, assisting with effective small group work, and improving the environment for learning are some of the new areas in which an audio-visual service is assuming increased responsibility.

These new responsibilities come at a time when the faculties of the state colleges have increased their demands on the audio-visual service for the performance of the initial function for which the service was established -- the provision of audio-visual service as an aid to instruction.

This revised statement of policy, therefore, reflects both the emerging responsibility of the audio-visual service program to encourage and assist in the development of new instructional techniques and resources and the increase in the provision of instructional services to the faculty.

THE PLACE OF THE AUDIOVISUAL SERVICE--AN ACTIVITY OF THE TOTAL INSTRUCTIONAL PROGRAM OF THE COLLEGE

Provision for instructional services is an accepted and an integral part of the organization of the California State Colleges. The audiovisual service is one of the instructional services provided in all state colleges.

Audiovisual service in a state college is established to support and improve instruction on a college-wide basis.

The exact relationship of audiovisual service to the instructional program of the college is established by the individual institution, taking into account the specific purposes of the institution and the total educational program in the state. Experience and practice generally place the director of the audiovisual service in direct administrative responsibility to the chief instructional officer.

Under qualified professional leadership, the audiovisual service is expected to provide and assure the effective use of audiovisual instructional materials and equipment.

The audiovisual service performs a consultation function, advising college faculty, administration, staff, campus organizations, and outside agencies in the selection, acquisition, preparation, production, utilization, and evaluation of audiovisual materials and equipment.

RESPONSIBILITIES OF CALIFORNIA STATE COLLEGE AUDIOVISUAL SERVICE

Audiovisual service in a state college is responsible for a variety of professional and creative obligations which involve the instructional and related affairs of the entire college. The audiovisual service is charged specifically with the following responsibilities:

Work with faculty members in analyzing and evaluating instructional problems and methods involving the use of audiovisual materials; and develop techniques and materials to achieve instructional objectives.

Provide for the collection and dissemination of information pertaining to new instructional media, including such developments as the application of automation to the learning process.

Cooperate with divisions and departments of the college in organizing, equipping, and maintaining audiovisual facilities and resources designed for the instruction of students, including such new facilities as foreign language and speech laboratories, teaching machines, instructional television, programmed self-instruction, listening facilities, and mechanized practice reading facilities.

Develop and operate a service program designed to provide, maintain, and circulate audiovisual equipment and materials for the college instructional program.

Procure audiovisual equipment and materials.

Consult and advise departments and divisions in the purchase of specialized audiovisual equipment and material.

Initiate appropriate requisitions in accordance with established purchasing procedures for audiovisual equipment and materials for general instructional purposes.

Plan and maintain facilities for the college-wide use of audiovisual materials including space, facilities and equipment in college buildings both existing and in planning.

Prepare materials, not readily available commercially, that are required for instructional use. Such materials include those used by extension courses, radio, television, and methods of programmed self instruction.

Provide, within the framework of local policies and budget allowances, audiovisual service for college sponsored special functions.

RESPONSIBILITIES OF STATE COLLEGE AUDIOVISUAL SERVICE PERSONNEL - TYPICALLY, INCLUDE THE FOLLOWING ASSIGNMENTS:

Professional staff, including the director, of the college audiovisual service. A major objective of the audiovisual services is to support and improve college courses. The director of the services should be recognized as a qualified teacher competent to discuss and advise on classroom procedures and the achievement of learning on the part of students.

It is essential that the student-faculty relationships of the director be maintained on an active, current basis by appropriate classification with academic rank and class identifying him as a teaching member of the faculty. A part of his assignment should be the teaching of regularly established classes.

Preferably the director should have a Doctorate. His specialized training and experience should include: an emphasis in the theoretical aspects of audiovisual communication; successful experience in audiovisual administration, a background in curriculum which will enable him to function effectively in the selection and utilization of audiovisual materials; knowledge and skills in the areas of production such as graphics, photogrphy, television, and programmed learning; and sufficient training in research to enable him to assess new developments in the field.

The director of the services should be a regularly recognized college officer (faculty member) whose duties can be described by the title -- Director of Audiovisual Service. His functions include:

Organization of the audiovisual service:

Plan and supervise audiovisual services for all college classes and other college-wide instructional functions.

Plan, organize, and maintain a system for circulation and utilization of equipment and materials.

Plan and supervise a program for the selection and acquisition of new materials.

Plan services to audiovisual classes, conducted as separate courses, integrated courses, or extension courses.

Recommend for appointment and supervise audiovisual service personnel.

Consult with faculty regarding audiovisual, radio, and television service policies and problems.

Attend and give leadership to instructional materials committees.

Maintain standard records of audio-visual service operations.[1]

Consultation with administration and faculty:

Consult with faculty on instructional or learning problems. Assist in locating, selecting or developing appropriate audiovisual resources or techniques.

Consult with departments, staffs, or teaching teams to determine instructional requirements in order to provide appropriate audiovisual facilities and resources.

Consult with administrators and faculty in planning audiovisual facilities and resources for all new college buildings or modifications of buildings.

With respect to the procurement of audiovisual equipment and materials:

Supervise the preparation of budget requests, requisitions, and justifications for audiovisual personnel, equipment, facilities and materials.

Consult with individual faculty members and committees concerning audiovisual requirements.

Test and evaluate new audiovisual equipment.

Preview and evaluate instructional materials.

Survey classrooms to determine needs relative to projection, darkening, ventilation, electrical facilities, accoustical treatment, and audio-visual equipment.

Advise in the planning and installation of audiovisual facilities for all new college buildings.

With respect to maintenance of college audiovisual equipment and materials:

Plan and operate a program of equipment service, repair, and overhaul of audiovisual equipment and materials, by contract, by technical staff, or by both.

Supervise technical staff.

Schedule technical staff assignments.

Supervise the requisition of tools, parts, and supplies.

With respect to preparation of audiovisual materials:

Plan, design, and supervise the preparation of audiovisual materials, including graphics, slides, motion pictures, photographs, posters, filmstrips and recordings, for on- and off-campus instructional use, including instruction by radio and television programs.

Supervise the sound and photographic recording of activities, projects, and programs having permanent value for instruction.

Assist instructors with the preparation of audiovisual materials for lectures, demonstrations, self-instructional materials, and other instructional activities.

General:

Serve on faculty committees and other professional committees.

Consult with commercial representatives on audiovisual materials, equipment, and supplies.

Perform such other functions as may be required by the administration.

Clerical personnel (supervisory and/or operational) under supervision of the audio-visual director.

Arrange for procurement of all materials from outside sources.

including preview, rental, or loans. Maintain correspondence, evaluations, guides, processing slips, and all other such items arising from the receiving, using, previewing, and shipping of these materials.

Schedule all services, equipment, materials, and facilities, including those for previewing, auditioning, delivery, projection, and recording.

Notify faculty and students of confirmations, new acquisitions, previews, past dues, permits, semester loans, and supplementary notices.

Collect, compile, and organize a library of reference data on audiovisual materials for staff and faculty use.

Type letters, reports, notices, requisitions, justifications, budget proposals, and other items required in the operations of the service.

Maintain files and records of all audiovisual service documents.

Serve as receptionist for the office, relating information and arranging appointments for the members of the service staff.

Receive and distribute telephone calls, memoranda, and mail.

Take and transcribe dictation at the request of the staff.

Gather, tabulate, and proofread statistical data.

Maintain a stock of office supplies.[2]

Prepare and maintain records and reports on audiovisual personnel for purposes of work, vacation schedules, and payroll.

Check invoices and verify for payment; validate receipt of requisitioned items.

Classify and organize new material acquisitions for the catalog.

Do accounting on budgets and inventories.

Perform other tasks as assigned by the director.

Equipment technicians (supervisory and/or operational) under supervision of the audiovisual director.

Maintain and repair, or supervise the maintenance and repair, of all audiovisual equipment loaned by the service or deposited in college divisions and departments.

Overhaul, or supervise the overhaul, of equipment and materials to the extent practicable in the college audiovisual facility and in the time available.

Supervise, or aid in the supervision of, student assistants assigned as projectionists and recordists.

Set up and operate projection, recording, and public address equipment as required for special college activities and functions.

Modify equipment and fabricate necessary improvements.

Design and construct audiovisual equipment and facilities not readily available commercially.

Construct special equipment such as speaker installation, audiovisual training devices, P.A. systems as required.

Assist the audiovisual director in technical matters pertaining to planning, selecting, and installing audiovisual equipment materials and building facilities.

Maintain, or supervise the maintenance of, service records for each piece of audiovisual equipment.

Maintain, or supervise the maintenance of, inventory of audiovisual equipment, replacement parts, accessories, tubes, lamps, and other materials.[3]

Provide the director with information on inventory to facilitate ordering of needed audiovisual equipment, parts, and supplies.

Check all new equipment received to assure its compliance with specifications and conditions.[3]

Assist in carrying out routine audiovisual service functions during rush and relief periods. Such assistance may include work at service counter, answering inquiries about audiovisual equipment, materials, services, and bookings.

Perform other tasks as assigned by the director.

Technical assistants (supervisory and/or operational) under supervision of the audiovisual director.

Be responsible for service counter functions and maintenance of service area, including securing at the end of working day.

Keep all audiovisual materials in storage areas according to the filing system established.[3]

Issue and receive audiovisual equipment and materials reserved for faculty and/or student use.

Maintain slides, tapes, phonograph records, charts, maps, and other audiovisual materials.

Receive from, and ship to rental agencies and other suppliers, all audiovisual materials booked for temporary use.

Clean, repair, and rewind motion pictures and filmstrips.

Assist in the maintenance of records and files on loaned audiovisual equipment and materials.[3]

Assist in conducting previews and in the scheduling of the rooms.

Make periodic inventories of equipment and materials stored in the service area, assigned to classrooms, and loaned to various departments.

Check and process new materials for circulation.[3]

Assist in the scheduling and operation of audiovisual equipment and materials for faculty and students.

Oil and clean equipment when necessary, and make other minor repairs and adjustments, such as replacing of lamps and belts.

Perform other tasks, as assigned by the director.

Stock clerk under supervision of the audiovisual director.

(In the past these functions have been assigned equipment technicians, clerical personnel, and others with special qualifications and training; the assignment of these responsibilities to a stock clerk seems both appropriate and economical.)

Maintain inventories, of a general nature, on replacement materials and supplies such as tubes, lamps, and tapes.

Process equipment, after it has been received and checked by the equipment technician.

Help keep all audiovisual materials in storage areas according to the filing system.

Receive from, and ship to rental agencies and other suppliers, all audiovisual materials booked for temporary use.

Assist in the maintenance of records and files on loaned audiovisual equipment and materials.

Assist in checking and processing new materials for circulation.

Assist in the inventorying of audiovisual equipment and materials, whether located in the service areas or assigned to various departments.

Assist in carrying out routine audiovisual service functions, such as counter work, telephone, bookings, etc.

Assist in ordering outside source materials and records.

Assist in the maintenance of a stock of office supplies.

Perform other tasks as assigned by the director.

Photographic personnel (supervisory and/or operational) under supervision of the audiovisual director.

Consult with faculty members to assist them with the planning and designing of photographic instructional materials.

Photograph, process, and print materials for instructional purposes in color and black and white to prepare flat pictures, slides, micro-films, filmstrips, transparencies, and motion pictures.

Photograph activities, projects, and illustrative materials within the photographic studio, on location, or utilizing close-up copying procedures, all with proper lighting and filming techniques.

Prepare, script, photograph, edit, and assist with the sound recording for brief film clips and simple motion pictures for direct instructional use.

Prepare photographic materials required for open and closed circuit ITV programs.

Be responsible for maintaining equipment, work facilities, supplies at necessary levels, and maintain records of inventory and work.

Supervise student assistants.

Perform other tasks as assigned by the director.

Graphic personnel (supervisory and/or operational) under supervision of the audiovisual director.

Consult with faculty members to assist them with planning and designing graphic instructional materials.

Design and execute art work for charts, graphs, printed materials, slides,transparencies, motion pictures, and other materials for projection, and visuals for closed and open circuit ITV programs.

Do lettering as required for titles and the content of graphic materials.

Prepare paste-ups of original materials for reproduction.

Mount art work, pictures, photographs, slides, transparencies, and similar instructional materials.

Prepare non-photographic transparencies and other instructional materials using such techniques as diazo, photocopy, and picture transfer.

Design and prepare flannel board, magnetic board, bulletin board, and other display materials.

Be responsible for maintaining equipment, work facilities, and supplies, and maintain records of inventories and of work.

Supervise student assistants.

Perform other tasks as assigned by the director.

Student Assistants.

The allocation of student assistance funds is a major factor in the economical and efficient operation of the audiovisual service program. Substantial support for student assistance is required to provide projection and recording services, delivery, set-up and take-down of equipment in instructional areas, for occasional assistance in preparation of instructional materials, in providing audiovisual services for special events in the college, and for assistance at periods of peak load. At such times, student assistance is required to supplement clerical personnel in the preparation of catalogs, ordering, and similar services. Practices differ on the several campuses in the allocation of student assistance funds, and local requirements vary in accordance with the scope and type of services provided. A formula has not yet been proposed for student assistance funds, but the problem is currently under study.

STAFF REQUIREMENTS OF STATE COLLEGE AUDIOVISUAL SERVICE

Basic Assumptions

The staff requirements of the college and audiovisual service should be determined with regard for the total scope of audiovisual services as outlined in this report.

In the case of any given institution, the number of persons required to carry on the work of the audiovisual service will vary with the size of the institution, as well as the actual volume of services performed.

The size of a staff may constitute a limiting factor upon the scope and quality of the service program. A sound estimate of staff requirements must begin with a realistic appraisal of the job to be done.

Formulas for staffing should be applied carefully in terms of the requirements of the individual institution, and with suitable corrections for any marked deviation from the normal or average service load for the institution of that size. For example, the assignment of major responsibility for the preparation of graphic-photographic material for instructional television or the extensive supervision of language laboratories.

Formulas for staffing should be evaluated periodically and revised in light of continued experience.

Introduction to the Staffing Guidelines

The classification and position qualifications set forth by the State Personnel Board are appropriate for all regularly employed non-academic audiovisual service personnel except student assistants.

The duties to be performed by the audiovisual service are numerous. Analysts studying the jobs to be performed and the personnel necessary to carry out the varied tasks, generally arrive at a classification including full-time,part-time, regular, and certificated personnel. The classification system suggested here has been arranged on the basis of the tasks to be performed. It should be remembered that the categories used here embrace all personnel (part-time, full-time, academic, and non-academic) for which the audiovisual service is responsible.

Professional personnel

Clerical personnel

Equipment technicians

Technical assistants

Stock clerk

Photographer

Graphic specialist

Student assistants.

Experimental staffing formulas for each of the seven divisions have been developed and tested by a representative group of state colleges over a period of more than ten years. Experience and experimentation has indicated that certain objective factors are indicative of certain personnel needs. It should be noted that in developing audiovisual staffing formulas, only those factors were used over which the audiovisual activity has little or no influence, such as: enrollment in full-time equivalents; number of full- and part-time faculty; and hours per week of operation.

Guidelines for staffing an audiovisual service

(see table, following page.)

GUIDELINES FOR STAFFING AN AUDIO-VISUAL SERVICE

(Recommendation of March 1, 1956)

Professional Staff $= 1/2 + \frac{X}{4{,}000}$

Clerical Staff $= 1/2 + \frac{X}{4{,}000}$

Equipment Technicians $= 1/2 + \frac{X}{3{,}500}$

Technical Assistants $= 1/2 + \frac{X}{4{,}000}$

Graphic Photographic Staff $= \frac{X}{5{,}000}$

A = Number of pieces A-V equipment & materials
B = Annual budget for all equipment & materials
C = Hours per week of operation
D = Number of motion picture projectors
E = Number of tape recorders

(Revision proposed May 1, 1962)

Professional Staff $= 3/4 + \frac{\frac{X}{5{,}000} + \frac{Y}{6} + \frac{Z}{100}}{3}$

Clerical Staff $= 1/2 + \frac{\frac{X}{4{,}000} + \frac{Z}{100} + \frac{A}{1{,}000} + \frac{B}{10{,}000} + \frac{C}{40}}{5}$

Equipment Technicians $= 1/2 + \frac{\frac{X}{3{,}000} + \frac{4D + 3E + 2F + 1G}{400}}{2}$

Technical Assistants $= 1/2 + \frac{\frac{X}{4{,}000} + \frac{A}{15{,}000} + \frac{C}{40}}{3}$

Stock Clerk $= 1/2 + \frac{\frac{X}{5{,}000} + \frac{A}{1{,}000} + \frac{B}{10{,}000}}{3}$

(Note: Not more than one position)

Photographic Staff $= 1/2 + \frac{\frac{X}{5{,}000} + \frac{Z}{300}}{2}$

Graphic Staff $= 1/2 + \frac{\frac{X}{5{,}000} + \frac{Z}{300}}{2}$

Student Assistants = (requirements under study)

F = Number of record players
G = Number of pieces of other major A-V equipment
X = Enrollment in Full Time Equivalent Students
Y = Number of full & part time personnel under supervision of the A-V Director
Z = Number of full and part time faculty

SPACE ALLOCATIONS FOR CAMPUS AUDIOVISUAL SERVICES

The college audiovisual service requires sufficient space and adequate facilities to enable it to carry out the functions outlined in Section II.

In a period of expanding college enrollments and of increasing demands upon the audiovisual service, provision should be made for adequate facilities to meet current and future needs.

The space requirements of the service should be determined on the basis of the functions of the service and the extent of the demands upon these functions. Typical functions include:

Consultation Services - individual and group meetings with faculty and students; conferences on preparation and evaluation of materials; demonstrations of materials and equipment.

Utilization Services - reception, preview and booking; materials distribution (to users and projectionists); processing and cataloging; inspection and repair; shipping and receiving; film and other materials storage; general storage; special areas such as after hours turn-in room.

Technical Services - shop area; storage, shipping, and receiving; projectionist and student assistant area; and related functions.

Production (Materials Preparation Services) - audio recording; graphics; photo studio, darkroom; film editing and viewing; faculty work area; shipping and receiving; storage; and other related functions.

Administration - professional offices; clerical offices; reference library; conference areas; storage.

Allocation of space for the audiovisual service recommended by the Division of Architecture's guidelines for planning a state college anywhere in California dated December 4, 1959, are as follows:

F.T.E.	Gross Square Foot Area	Square Footage per each FTE
5,000	8,000	1.6
10,000	12,000	1.2
20,000	20,000	1.0

Additional space should be provided when the audiovisual service is responsible for such functions as: language laboratories, teacher education laboratories, television studios, preparation of television materials, motion picture studios, radio studios, student work areas (for preparing AV materials), special areas such as for teaching machines, individual student study areas, work and storage areas in other campus buildings.

AUDIOVISUAL EQUIPMENT AND FACILITIES

In instructional buildings

It is economical practice to incorporate adequate physical facilities for audiovisual services at the time buildings are planned and constructed.

Responsible personnel in the audiovisual service should be included in discussions at each planning stage for new buildings or for building modifications to insure that appropriate audiovisual facilities are incorporated.

To prevent inadvertant omissions or improper modification of plans for audiovisual facilities during the many stages of planning through construction, follow-up of details by audiovisual service personnel should be both expected and authorized.

Provision should be made for appropriate interconnecting facilities for television, audio, and other instruction systems among existing and proposed college buildings.

All classrooms, auditoriums, and other instructional areas should have provisions for the following:

Room darkening that provides effective light control.

A Artificial lighting designed to permit appropriate room light levels when using different types of projection equipment, and appropriately placed light switching controls. In general,
ty typical classrooms should be lighted to permit control from front to back of each room.

Screen and speaker installations.

In the audiovisual service area

Equipment represents a major part of the total investment in audiovisual services. It is also a major factor in the effectiveness of the program. Selection and purchase of equipment must be effected efficiently and economically.

It is considered efficient and economically practical to coordinate in the audiovisual service the functions of procuring, scheduling, repairing, servicing, and replacing all audiovisual equipment on a campus.

Planning specifications for purchase of audiovisual equipment for the college instructional divisions and departments should be a cooperative matter in which the audiovisual service has a major responsibility to insure purchase of optimum quality and types of equipment.

The audiovisual services should maintain and regularly re-examine both standard equipment lists and criteria for qualities of equipment to insure that the instructional needs of the college are met.[3]

There shall be constant evaluation of equipment utilization records to determine the efficiency of utilization, quantities of equipment required, and best procedure for circulation or deposit of equipment. The use of elapsed time meters on all electrical motor-driven equipment is recommended.[4]

Equipment complements will be maintained which will insure that all instructional areas have access to appropriate A-V equipment either through circulation from the service or by deposit by the service. This basic complement of equipment for general instruction classrooms include: projection screens, wall speakers, projection stands, equipment tables, sound projectors, overhead projectors, tape recorders, record players, radios, television receivers, public address systems, sound-slide projectors, electronic demonstration magnifiers (simple television systems).

Criteria for the selection and responsibility for audiovisual equipment for special instructional functions and areas, such as language laboratories and teaching machines, will be developed to serve the program of the several colleges.

Equipment maintained in the service area to accomplish the objectives outlined in Section II of this statement will include such items as listed below:

Recording and tape duplication: tape recorders; high-quality, high-speed, tape duplicating equipment.

Preparation and production of materials-photographic: film processing equipment; copy stands; accessories; contact printers; enlargers; print and negative washers and dryers; slide copy units; still cameras (35mm, reflex, press, and view); motion picture cameras (16mm and 8mm); lights and light stands; light tables; editing equipment.

Preparation and production of materials-graphic: dry mount press; lettering devices; drafting and drawing aids; transparency reproduction equipment such as electrostatic, heat process, diazo, photocopy; paper cutters; air compressor or supply.

Film library: film racks (film and filmstrip); rewind, splicing, and editing equipment; film inspection machines; rotary or drawer-type files for booking; catalogs and reference facilities for faculty and student use.

Previewing facilities: filmstrip viewers; projection and audio equipment as needed to service individuals, small and large groups; projection stands; screens; and speakers.

Shipping and receiving: scales; tables and counters for wrapping; labeling devices.

Storage and filing: equipment and materials cabinets; files; shelving and racks.

Equipment service and repair: various sizes and types of hand tools; air compressor or supply; assorted professional quality electronic test equipment; heavy-duty work benches and tables; electric drills; drill press, lathe, and grinders.

Administration and clerical: tables; desks; chairs; cabinets; files; typewriters; office machines; intercommunication systems; and duplication equipment.

FOOTNOTES

1. The standard Report Forms are contained in the Manual of Suggested Operational Procedures for Audio-Visual Directors.

2. An analysis of the operation of the Audio-Visual Centers over a period of several years indicates that these functions should be performed, in part, by another classification - Stock Clerk.

3. Suggested levels of equipment availability are found in the Manual of Suggested Operational Procedures for Audio-Visual Directors. These current suggestions are a modification of a basic list prepared by the Directors of the State College A-V Centers for their own guidance in 1947.

4. A statement on the use of elapsed time meters, together with specifications for such meters as used in the several State Colleges will be found in the Manual of Suggested Operational Procedures for Audio-Visual Directors.